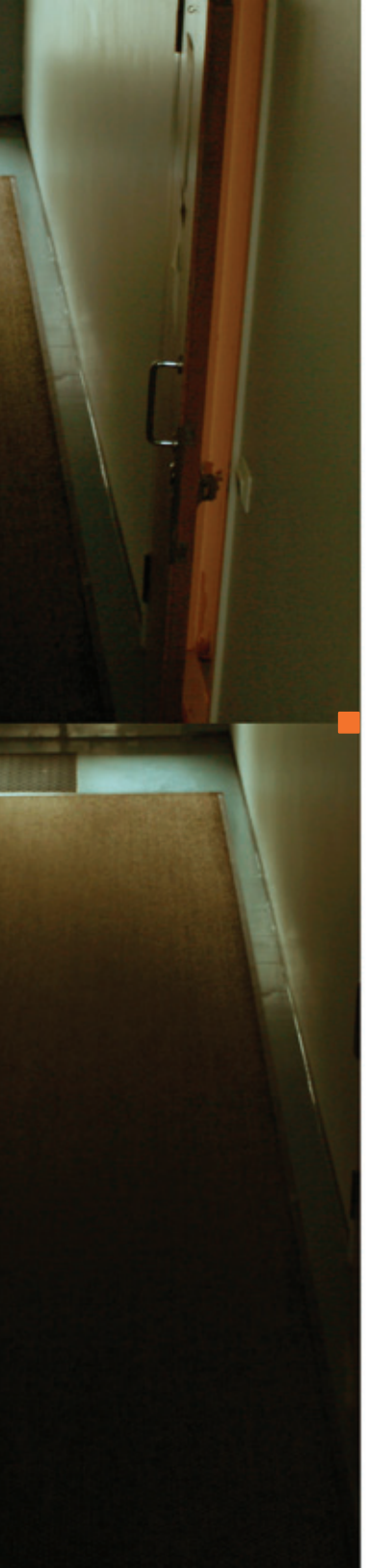


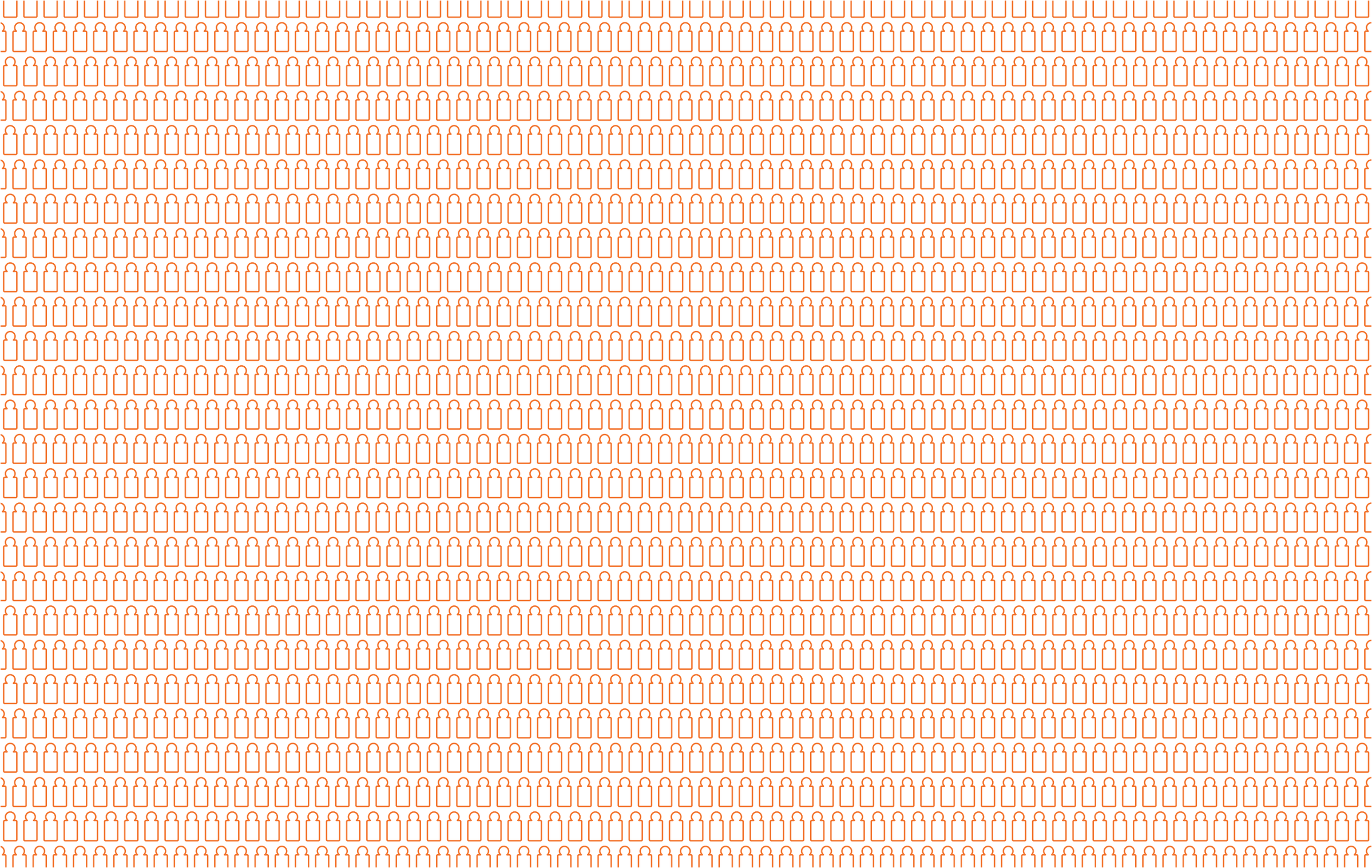
People's Relationship with Energy: How to Build Value on Energy Consumption Monitoring with Service Design

A Case on District Heat Monitoring Service by Helsingin Energia

Master's Thesis
Taru Hynynen
Autumn 2012

Aalto University / School of
Arts, Design and Architecture /
Department of Design

Aalto University



Department	Department of Design, Degree Program of Industrial Design	*Faculty*	Aalto University, School of Arts, Design and Architecture
Author	Taru Hynynen	*Title*	People's Relationship with Energy: How to Build Value on Energy Consumption Monitoring with Service Design A Case on District Heat Monitoring Service by Helsingin Energia
Subject	Service design and sustainability	*Level*	Master's Thesis (MA)
Abstract		*Month and year*	October 2012
		Number of pages	187

This thesis explores the possibilities for building value adding services using service design in the realm of sustainable development and increasing demands within energy efficiency. The purpose of this thesis, commissioned by Helsingin Energia, is to find new service opportunities and measures for the development of the existing energy consumption monitoring service SävelPlus provided within district heat services. The context of this thesis is Suburb 2072- joint venture, funded by the Finnish Innovation Fund (TEKES) and coordinated by Living Places research group at the Aalto University School of Arts, Design and Architecture (ARTS). The thesis identifies current energy efficiency regulation initiated strategies and issues related to smart-metering and other energy services aimed at energy end-users. Further, a study is conducted to identify real needs of end-users within energy services, and an alternative is suggested. The identification of needs is carried out using a case of energy consumption monitoring service SävelPlus and a housing company Kaarikuja 5 in Mellunkylä Helsinki. The customer and user-centric needs are studied and recommendations, service development directions and guidelines, are compiled and reflected to the current issues and strategies identified. The method of design research applied is participative action design research that introduces the notion of participatory design and the process of action design research. The main insights gathered within this thesis are that the current strategies, often cost-efficiency and normative messaging-driven, used to speak to energy end-users are not necessarily creating value for the offering of energy services. The alternative presented in this thesis suggests new content and functionalities aiming for the improvement of visibility between the different actors within Kaarikuja 5, introduction of new skills and knowledge to act and the enabling of long-term planning of heating within energy renovations. The recommendations together with design guidelines and suggestions for repositioning of SävelPlus are introduced for the use of Helsingin Energia's service and product development where they are currently being utilized.

Keywords service design, sustainability, participative design, action research, energy efficiency, smart-metering

Acknowledgements

The collaborators and enablers of this thesis are Helsingin Energia, the housing company Kaarikuja 5, the maintenance company Kontulan Huolto, and the researchers and students within the joint venture Suburb 2072. I want to thank the members of the board of Kaarikuja 5, Juha Karjula and the maintenance man Simo, all interviewed residents and the team within Helsingin Energia.

A special thank to Turo Eklund, the main support from Helsingin Energia, today a colleague, and Katja Soini the tutor and guide within Aalto University.

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Foreword

In 2010 I was interviewing residents in Helsinki around the subject of smart energy metering technologies aimed to be used in near-future home environments. Smart digital screens, mobile phone applications and web-based platforms were tested to find out if people would accept these newcomers into their Finnish homes. I met people in their kitchens and living rooms, sat myself in a couch, an armchair and on a kitchen chair in front of a cup of coffee and buns to hear these people describe what sustainability and energy meant for them. They explained me how they plan their weekly stroll to the grocery store to pass by the recycling point, or how the washing of the dishes is organized daily for not to waste water. These people talked about upbringing and common sense and good habits already acquired as a child, technology was not mentioned in this context. Here, the shiny screens and advanced mobile devices seemed out of place and with no reasonable meaning or use.

The interviews made me wonder how the life of these people would change, if such a technology is pushed into all housing as a new standard for good living. The stroll to the supermarket would have to be put aside as the amount of empty glassware is weighed by a smart kitchen device announcing directions and needed actions. Washing the dishes would be transferred into numbers and quantities, goals and warnings. Change is inevitable and we all know that, though one can have several different views on the quality and direction of that change and it is precisely that quality and direction that puzzles me.

Homes of these interviewees are part of built urban environment facing a great deal of demands for more sustainable way of life. Digitalization and introduction of different new means and tools to steer residential behaviour is taking place as one of the consequences of this turn. The impact of this kind of digitalization involving the powers of international and national regulation and legislation is not about introducing a piece of technology as the season's wallpaper or tableware into the consumer markets but a comprehensive change in people's everyday life. Solutions for sustainable development are decisions for the long-term, and often it is people, the end-users, who actually deal with the after effects.

Design stands on a fundamental significance making way to a variety of possibilities on how the issues are faced and how change is enabled. In this thesis I seek ways to face future demands without enabling undesired technology-driven solutions as they are just behind the corner. These solutions or "fantastical science fiction futures" as described by John Thackara (Thackara, 2005), are already taking place in all areas of our life. Intel has for example introduced a technology called M2M enabling machine-to-machine communication between cars to prevent accidents and help manage traffic. Real-time data is shared between cars on other vehicles and the driver is automatically warned about possible safety threats. The technology would transform our relationship to a car for good just as smart metering would do for our use of energy. What if we find out that the issue behind the car accidents was really not about restricted visibility of the driver but deliberate ignorance of safe driving? Would the system be hacked by its users? Would the behaviour be actually intensed by the system? Would residents keep on wasting energy? Would the system build up more ignorance?

1 / Introduction

1.1 Service design and sustainability

This thesis explores the dimensions of design within sustainable development[1], the efforts in meeting the needs of the present without compromising those of the future, by looking into the meaning of design in the international struggle with climate change, the most critical challenge of our modern society (Boyer et al., 2011). The area of design in question is service design, the creation of useful and desirable services from the point of view of the user[2] and customer (Mager, 2008), currently found attractive and appropriate for delivering solutions. Opportunities and possible negative impacts are viewed and the dynamics between businesses, customers and design in the creation of new services are described.

The challenge represented by climate change that is shaking the grounds where businesses are currently operating on is taking place as a major force in the background of this thesis. New demands are arising as an acute need has emerged to act differently in the way how products and services are produced and offered in order to tackle the effects they are having in the world (Ministry of the Environment, Statistics Finland, 2009).

1 The definition of sustainable development according to the Brundtland Commission states that sustainable development is the "ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own need", World Commission on Environment and Development (WCED), Our Common Future , New York: Oxford University Press, 1987

2 The term user is applied in the thesis when referring to the use of a service or a product.

Nations and international consortiums have responded to the challenge by building regulating and policy driven mechanisms into an interwoven landscape of restrictions, barriers and guidelines reaching the level of municipal decision making[3], to pave the road towards a better future. These mechanisms are presenting critical changes as businesses and entire industries are under legislative obligation to decrease their climate change-related impacts. Energy companies are among those industries facing changes possibly worsening their main business operations as the demand for energy need to be cut down due to the impacts it is generating in the form of emissions. Helsingin Energia, the commissioner of the thesis, is part of the previously described energy sector and one of the businesses facing the new circumstances. Adapting to the new situation is one of the key motivators of Helsingin Energia and also an issue to be explored within this thesis.

Targets of the sustainable mechanisms aim for end-users, the people paying and using or interacting with the systems introduced within products and services (Beyer & Holtzblatt, 1998), besides the supply side regulation. The impact of consumers and end-users into the contribution for climate change is considered considerable (Swim et al., 2009), and therefore measures and strategies are also aimed beyond the supply side. Some of the mechanisms primarily aimed at institutions and businesses are actually targeting to the customers and end-users aiming to change the way how

3 The city of Helsinki for example has set targets within the international and EU-level climate change framework impacting companies, including Helsingin Energia. The measures are targeted to the supply side and they are binding up to the year 2020 (Record of a meeting, the City of Helsinki and Helsingin Energia, 28.9.2010).

products and services are consumed and used. Any problem solving within sustainable development cannot ignore the powers behind consumption and use and therefore, the consumer and user have a major role, starting already from the premises of regulation, also in this thesis.

The powers of the consumption side also play a role within new opportunities. New areas of businesses are being introduced to industries as the implementation of the mechanisms requires new solutions for the changing cases of consumption and use (Morch et al., 2007). New products and services are already taking place, for example in the energy industry in the form of new technological applications aimed at consumers and end-users. These energy services and applications are introduced to customers to comply with the regulation and simultaneously to provide valuable service. Ways to speak to the consumers and users through these technologies are though facing judgment and doubt as the technologies are harnessed to deliver the desired impact by using means such as latent messaging (Nolan et al., 2008). Critical assessment on current means and mapping of alternatives is therefore needed to appropriately respond to the emerging new markets of these services and applications. The review on current strategies is therefore included into this thesis as the starting point for searching and introducing new alternatives.

Energy services and services in general contribute more widely into the contemporary economy as an increasing area of business (Maffei et al., 2005). The increase is not only calculated in the vast amount of companies or offices offering services and planning them, but also according to

the current position services hold. Having established the foundation in the economy in the societies of developed countries (see chapter 3) services are breaking through from the traditional notion of services being bound to a specific sector of companies rather into a dimension and a way of thinking (Maffei et al., 2005). Services also hold an interesting position as the needs of the contemporary economy, consumer and user, are managed in an increasingly complex context of climate change, requiring new models over the standard service and product setting (Manzini & Vezzoli, 2002). Services are even claimed to overcome products as the primary form of delivering value to the customer, and the concept of a product being non-existent in the contemporary terms (Miettinen & Koivisto, eds., 2009). Services can be thus considered as an established economic force and also to have a place in the creation of future innovations.

Service design functions as a response to the search for alternatives within the upcoming wave of energy services and applications, besides the search for new innovations in general (Maffei et al., 2005). It operates as tool to guarantee rich services and consumer and user need-driven solutions by possessing specific characteristics in the way the services are viewed and planned. The approach within service design is looking into the needs of an individual customer (Miettinen & Koivisto, eds., 2009) and up to the big picture out in the world (Suri, 2008), and differentiates it from the more organizational way of looking services. Service design also possesses a process that contributes to the customer and user needs by engaging the consumer and the user already from the beginning of the planning until the actual production and use of the service

to meet the real needs (Miettinen & koivisto, eds., 2009). Service design thus functions as the an appropriate approach for creating new services when the needs of the contemporary economy, consumers and users are to be met.

The close relationship with the consumer and user in the planning of services is also contributing to a broader need for open collaboration between designers, organizations, and existing and future users (Binder & Brandt, 2009). Companies are getting closer to users and consumers through the mediums of dialogue and participation. The inclusion of the consumer and user therefore does not serve only the purpose of conducting the right process within service design but embraces more general attitude in the contemporary product and service development. Service design thus both follows the contemporary attitude within product and service development and it simultaneously functions as an appropriate approach for creating new services.

In the realm of the described background forces and key driving motivators, this thesis conducts the means and processes of service design, including the participation of the consumer and the user. The current means for implementing the climate change-driven regulation within consumption and use cases are reviewed, and new energy service opportunities are explored by diving into the needs of the energy companies, consumers and users in the context of the energy industry. The review is conducted in a general level where as the service opportunities and the participation is conducted through a case in the context of a commission from Helsingin Energia and framing initiatives.

1.2 The Commission from Helsingin Energia

Helsingin Energia as an energy company within the international energy sector is currently facing the climate change driven regulation and on the other hand, the new energy product and service opportunities. The new opportunities can be harnessed only by meeting the required customer and user need-driven needs not currently met by Helsingin Energia. The current problems are defined in order to readjust the existing service offering and introduce new ones. The already existing service offering of Helsingin Energia is described and reviewed in the following in order to create a comprehensive picture of the problem space and the main challenges. The commission for this thesis project is compiled according to the following definition and description of the problems and challenges together with the higher level need for the provision of new energy services.

1.2.1 The problem space - Energy service SävelPlus

The problem space is focused around the energy monitoring service SävelPlus[4] next to other service offering within Helsingin Energia. Included challenges and problems related to SävelPlus are found in the outcome of the service, the service delivery process and the overall customer relationship (see chapter 3).

4 www2.helen.fi/raportointi

Services typically consist of the core service, the main service delivery provided to the customer, facilitating services, the mandatory service activities supplementing the core service and supporting services, optional service activities that contribute to the convenience of the use of the service (Miettinen & Koivisto, eds., 2009). At Helsingin Energia the core service consists of the production and distribution of district heat, the facilitating services again are composed of service activities such as maintenance measures and the energy consumption monitoring service SävelPlus functioning as the main supporting service. The focus of the commission and the problem space within the entity of Helsingin Energia's service offering is SävelPlus, which is a free online energy service application for the customer to use for monitoring energy use at households'[5] heating energy consumption provided by the service provider as a value adding supporting service.

The aim of the outcome of SävelPlus is currently awareness on energy consumption related information including consumed amount of energy, and monetary and environmental costs which is the most typical information provided within smart metering services in general (see chapter 3). Information on few specific areas around the functionality of the heating machinery is also provided. According to the findings in this thesis, the customer has the major responsibility in the production of the service experience, in terms of the service delivery process, while the service provider stays mostly passive in the background (picture 1). This results in passive customer relationship and overall interaction between the

5 Altogether the application consists of energy consumption monitoring on electricity, heating and cooling, though they are separately accessible.

customer and the energy supplier. Different users are not currently considered in terms of the content and functionalities and the service content and functionalities are accessible only online.

The current service delivery process and the outcome are not reaching the desired level as a value adding service and therefore the elements both in the process and the outcome need to be redefined. The passive customer relationship and lack of interaction between the service provider and the customer and user of the service need to be rebuilt to utilize and recognise changing customer needs. The content of the service again being equivalent to that of typical smart metering services and products (see chapter The emergence of smart metering), leave room for differentiating from other similar existing services. The existing offering of energy services needs to be therefore readjusted and simultaneously new service activities need to be designed and produced. This thesis investigates these aspects to meet and harness the emerging new service opportunities.

1.2.2 The commission

The purpose of this thesis in relation to the previously described demand for new and improved energy services is to find new service opportunities and measures for the development of the existing energy consumption monitoring service SävelPlus within district heat services provided by Helsingin Energia.

The commission includes the challenges and problems within the service outcome and service delivery process to be solved and the customer relationship to be revised through recommendations and design guidelines. The recommendations and guidelines resulting as the outcome of the thesis project are used further in the product and service development activities aiming into the concepting of next version of the SävelPlus service. The main target group to be considered is the end-users of district heating translating into the actual customers and residents who currently emerge indirectly as the end-users compared to the actual customers[6]. The new opportunities are to bring about added value for the current and future district heating customers and end users.

The outcome of this thesis needs to contribute to both practical and higher level development opportunities in the introduction of new energy services having the focus of both recommendations and guidelines in the existing energy service monitoring SävelPlus. The recommendations also need to comply with the intentions of the service both in the context of business performance and climate change- driven regulation.

6 The field of district heating refers to the property as the primary unit for a customer. The customer relationship is therefore basing on a contract between the management of the property and the service provider where the end users of the heating services, in the case of an apartment building for example, are residents not all included into the group of people to whom the service activities are directed for.

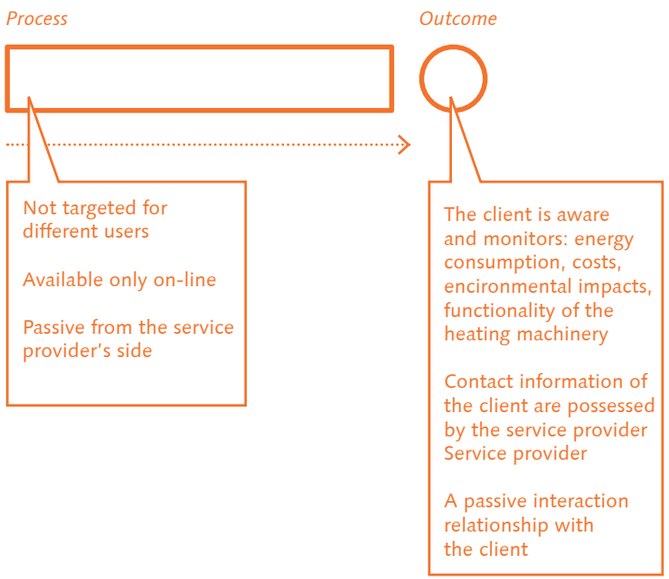
1.3 The context – Framing project and realization

The context of this thesis and the commission from Helsingin Energia includes the framing initiatives, practical realization and the target audience. In the following the framing initiative of the Suburb 2072- joint venture or the framework project as referred by Manzini and Rizzo (Manzini & Rizzo, 2011) and the connection to the thesis are described. The circumstances and responsibilities within the realization of this thesis and the different target groups for the contributions of this thesis are also described.

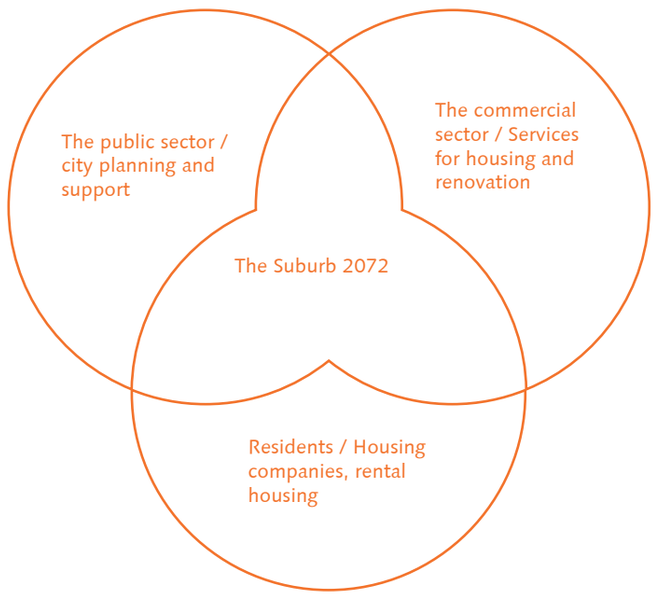
1.3.1 Connection to the Suburb 2072- Joint venture

This thesis is connected to a larger, joint venture named Suburb 2072- Outlining a participatory approach for using building renovation momentum for wider effects (Heikkinen et al., 2012), funded by the Finnish Funding Agency for Technology and Innovation (TEKES) as the main funding party and coordinated by Living Places research group at the Aalto University School of Arts, Design and Architecture (ARTS)[7]. The joint venture between 2012-2014 is composed of a research project and two development projects under a shared venture agenda of transforming the momentum of housing renovations to an opportunity of revitalizing suburban neighbourhoods.

7 The venture is coordinated by Living Places- research group from the Aalto University ARTS and managed by the director of the research group TT, MA Sari Dhima. Project manager of the venture is MA Katja Soini who is also tutoring this thesis.



Picture 1.The current process and outcome of the SävelPlus-service.



Picture 2.The point of views meeting in the Suburb 2072- joint venture.

This thesis is a part of a development project called Smart District Heat that is funded and initiated by Helsingin Energia. The joint venture represents the higher level values and goals and constitutes the broader context of chosen social perspectives and physical dimensions as a shared starting point for the research project and the development projects and also for this thesis.

The goal of the research project within the joint venture is to create a resident- centred operations model for the long-term development of suburbs of Helsinki built in the 1970's that are currently facing fundamental renovation measures. Increased demands in energy regulations resulting in considerable renovation activities, the broadening diversity in the needs of the residents and the existing social communities originating in the 1970's suburbs formulate the most important challenges to tackle. The upcoming renovations are possible to manage successfully in pursuance of increased quality of living by taking these challenges into account with a resident-centred approach. The joint venture seeks ways to utilize brand-thinking to face the last-mentioned challenges and contributes in practice to the planning, decision making and implementation activities related to the future development of these suburbs.

The agenda of the joint venture includes the idea of radical action where innovation is being made with existing resources. The prospective renovation activities, representing the core of the Suburb 2072, are basing on the consensus of building on existing physical dimensions, the building structures, and socio-cultural dimensions, the communities, to meet future needs. Also the existing resources being studied in the context of the Smart District Heat development project comprise of the built and social environment. This thesis is focused especially on the dimensions of the existing energy-efficiency related user behaviours around energy consumption monitoring and tools as the resources within the communities and the built environment.

The agenda of the Suburb 2072 includes also the ideas of journey and neighbourhood. The journey is explicated as an iterative and cooperative process in the form of research, workshops, meetings events and partners in cooperation. These activities engage actors representing the user and inhabitant perspective as well as the public and commercial sectors (picture 2). The neighbourhood represents the target under study both as a concept and a physical location. The cooperative parties of the process referred here are Helsingin Energia and residents in the context of the thesis and the iterative nature of the process is conducted in the practical research work of the thesis. Neighbourhood in the context of the thesis is handled as the target location of practical research work.

The different point of views incorporated in Suburb 2072, are shared with the thesis, having the emphasis on user- and resident-centred perspective. The perspectives are implemented in the thesis work through chosen research methods and in the overall approach of the study.

1.3.2 Funding and practical realization

The funder and commissioner of this thesis is energy company Helsingin Energia owned by the City of Helsinki. The thesis project and the cooperation with Aalto University ARTS are carried out within Helen District Heat, one of the operational services in Helsingin Energia managing the sales, distribution and the production of backup and peak demands of district heat. The thesis project and the Smart District Heat development project are managed within Helsingin Energia by senior advisor Turo Eklund from the marketing and product development department. Eklund forms a team, together with Pekka Takki and Reijo Lemetyinen, working within sales and product development from the Product development and marketing department at Helsingin Energia that supports and monitors the progress of the thesis work. The planning and practical project realization is fully carried out by creator of the thesis. The practical work of the thesis project is consisted of internal work contributing to the thesis project managed within Helsingin Energia and shared meetings and workshops contributing to the research within the Suburb 2072- joint venture with partners in cooperation.

The realization is agreed and planned between the creator of the thesis and the commissioner Helsingin Energia including areas of responsibilities and funding. The role of Aalto University ARTS is more guiding and supportive whereas the practical realization is mostly managed between the creator of the thesis and the commissioner.

1.4 Structure of the thesis

This thesis consists of two main levels contributing to the goals and contributions between the commission and overall agenda of the thesis. The chapters 3, 6 and 7 address the overall agenda in the context of goals and contributions whereas chapters 4 and 5 describe the case used in this thesis including the description of the approach, methods and results.

The comprehensive structure of this thesis consists of introduction and the design challenge including the research questions (chapters 1 and 2), the general overview on service and sustainability- related issues taking place as the background force for the case (chapter 3), the case of Kaarikuja 5 and participatory design approach including the description of the target location for the case, the approach and methods (chapter 4), the results including gathered insights and understanding within the case (chapter 5) and finally the discussion and the recommendations responding to the commission and the overall outcomes in terms of the research questions (chapter 6 and 7).

The chapters describing the case are separated from the overall study, besides the discussion, where the case and overall agenda of the thesis are reflected to each other.

2 / The research challenge

This thesis is a study on design research, a field where research is conducted by looking into the past, present and future (Suri, 2008) by utilizing inspiration from design traditions, social sciences and engineering (Koskinen et al., 2012). In the following, the design research challenge is outlined and the limitations, objectives, contributions, research questions and the applied research method are described in the context of the commission from Helsingin Energia and the framing project Suburb 2072.

2.1 Research Questions

Research questions of the thesis are basing on the chosen subject, commission and framing initiatives (see chapter 1) and they guide the approach and methods applied in the study of the thesis. The research questions in the thesis are:

1 How to build value on energy consumption monitoring service?

2 What issues are related to the means and strategies currently used to speak to energy end users?

3 What needs there are to be considered when including the resident into a value adding energy consumption monitoring service?

The research questions consist of the main research question (question 1), and two other sub-questions aimed for the general review on issues related to sustainability and services within the energy industry (question 3), and the case (question 2). The main research question (question 1) is about finding ways to create value adding energy consumption monitoring service within district heat by using service design. The question includes issues to be found such as: what overall directions can be used to create the service? What content and functionalities could the service provide? How the means of service design could be used to deliver value adding service? The main research question is answered in the context of smart metering and energy services corresponding to the energy monitoring service SävelPlus and the results emerging from the case.

The research question 2 explores the strategies and means currently used to speak to energy end users, and possible issues related these strategies and means. The question includes subject matters to be found such as: what characteristics are related to the smart metering and energy services? What are the different means and strategies used to speak to energy end-users? What problems and challenges are there possibly related to these means and strategies? The question is explored in the context of smart metering and energy services corresponding to the energy monitoring service SävelPlus.

The research question 3 is about finding out customer and user needs related to energy consumption monitoring within district heat to be considered in building value adding energy

consumption monitoring service. The question includes subject matters to be found such as: what drivers and hurdles related to energy consumption monitoring there are to be found? What service-related elements and phenomena are there to be considered?

The research question 2 is explored in the chapter Service design in a world of climate change (chapter 3). The research question 3 is explored in the chapter Results – Visualizations on energy consumption activities (chapter 5) and the research question 1 is answered in the chapter Recommendations for the next version of SävelPlus and Discussion - How to build value on energy consumption monitoring (chapter 6 and 7).

2.2. Method - Participative Action Design Research PADR

2.2.1 Understanding and engaging actors as collaborators

The method of design research applied in the thesis is participatory action design research (PADR) that originates from the tradition of Scandinavian systems design in the form of a shared language and dialogue between a designer and a user (Ehn, 1988). The PADR connects the notion of participatory design, the involvement of non-designers as producers of knowledge emerging from different background than design (Binder et al., 2010), and the process of action design research where explorations are conducted by going into the actual everyday environment of the service or the product to be designed (Binder, T., Brandt, E., Clark, et al., 2010). The realization of the PADR is conducted by using a case when the events can be observed to take place non-stop in contemporary real-life context (Yin, 2003).

The qualitative research within the PADR and the context of the thesis, consists of activities typical to design research through the inclusion of real context, the field (Koskinen et al., 2012), resulting into outcomes aiming into the discovery of design opportunities, inspiration and informed intuition (Suri, 2008) rather than finished concepts. The gathering of these opportunities is carried out by focusing on process phases, generally understood in the field of service design as understanding, discovery (Design Thinkers, 2011) or service design understanding and thinking (Moritz, 2005).

The understanding is carried out by mapping out the context of the latent and conscious needs (Moritz, 2005) of the customers and users, or the non-designers, developed further into recommendations. The proceeding phases of concepting and the actual planning of the service, implementation as well as the evaluation are excluded in this thesis.

The participatory method is conducted by using an adapted PADR[8] design research process where the customers and users, the non-designers are engaged as partners with the ability to participate and collaborate (Binder & Brandt, 2008).

8 The PADR method is introduced by Maung K. Sein, Ola Henfridsson, Sandeep Purao, Matti Rossi and Rikard Lindgren (Sein et al., 2011) to address the problem of insufficient considering of the use context in designing IT artefacts, having the role of the interaction of the use context currently addressed as a separate and therefore inefficient research phase.

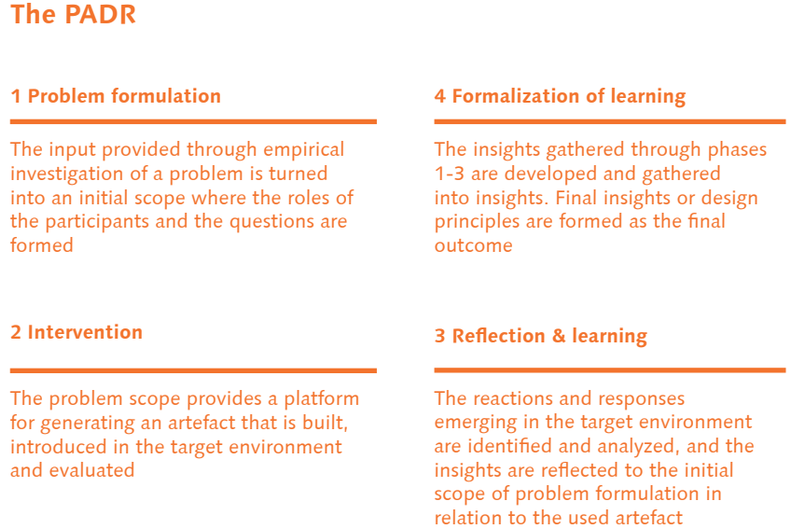
The customers and users are perceived as social beings (Suchman, 1985) responding and acting in social interaction and therefore referred from now on also as actors. The process is implemented by using several techniques supporting the approach, described in chapter 4.

2.2.2 The process - Learning by doing

The PADR is introduced as a process addressing simultaneously problem formulation, understanding and suggesting of a solution as an iterative, interwoven series of research activities (Sein et al., 2011). The cyclic working supports the complex nature of services (see chapter 3) where creative solutions out of various elements are needed (Mintzberg & Westley, 2001), and serves better the delivery of recommendations when compared to more straightforward service design processes typically aiming for a final solution. Tentative approach is recommended also and when working under time pressure (Miettinen & Koivisto, eds., 2009).

The process includes phases of problem formulation, intervention, reflection & learning and formalization of learning (picture 3). In the first phase, the input from preliminary understanding is turned into a scope where questions are formed and the participants defined. The second phase consists of building a tool for intervention that is then introduced into the target environment. The intervention is followed by reflection and learning where reactions and responses of the participants are identified and analyzed and mirrored to the initial scope and the intervention tool. Finally the insights gathered in the phases one to three, are compiled and the final outcome of insights and recommendations formed. The process is conducted by repeating the phases one to three until a sufficient understanding is reached and the final insights, the phase four, can be performed.

The practical implementation of the PADR is described in the chapter Case Kaarikuja 5 and participatory design approach (see chapter 4).



Picture 3.The process of participative action design research.

2.3. Contribution

Objectives and contribution
The study of the thesis contributes within the commission to the ability of Helsingin Energia to recognize the respective needs of the residents, the end-customers, and to develop and allocate better energy monitoring service SävelPlus aimed for those needs. The understanding and recommendations generated through the study contribute to the concrete starting point for the new user-centred energy monitoring service SävelPlus aiming in: increase in the utilization rate of the service, richer interaction between the residents and the service provider, utilization of user provided information and activation of residents in the context of district heat and energy efficiency.

Next to the primary objectives of the commission, the objectives of the thesis within the joint venture are defined in correspondence to the overall objectives of the Suburb 2072-joint venture (see chapter 1). The thesis contributes partially to the objectives of the joint venture by providing understanding and mapping of new energy-related service opportunities. These opportunities and understanding serve the joint venture in the form of measures for improved energy efficiency available for the communities already in the present life of the suburbs, before the intended future renovation measures, being at the heart of the joint venture.

The study of the thesis contributes primarily to the service and product development needs of the commissioner Helsingin Energia. Objectives are also met indirectly within the joint venture as the understanding and recommendations aimed for Helsingin Energia also contribute to the goals of the Suburb 2072- joint venture. Contributions can be also found beyond the commission and joint venture as the results of the thesis work are public.

The Audience- To whom is this thesis for
The project being user-centred in its approach and methods, it is more than desirable that the results of this thesis in terms of new ways of thinking in energy management of a housing company are shared with residents and especially the board of all housing companies or those in the position of decision making concerning future solutions within residential housing in Finland. The thesis simultaneously speaks to the planners in the internal processes of product and service development and publically to the academic world of design research. The thesis also serves an audience with practical agendas, the residents and people in a position of decision making within housing companies.

This thesis aims in providing understanding on service design possibilities on energy consumption monitoring for the commissioner Helsingin Energia representing the private sector, and for the public sector and partners in cooperation through the Suburb 2072- joint venture (Heikkinen et al., 2012). The results of the thesis in terms of the content around service possibilities and user understanding are aimed for internal use within the product development of Helsingin Energia. The same results are also shared through communication in

the form of events and printed materials for the use of Aalto University ARTS and all partners in cooperation including actors from both public and private sectors. The results serve both long-term and short term decision making around services in the context of suburban housing services.

2.4 Limitations – What can and cannot be answered

This thesis addresses sustainability with the approach of design research by providing understanding and recommendations through the means of service design and supports direct sustainable actions through its results. Helsingin Energia, the commissioner, observes the changes caused by these actions and measures the impacts, the amount of consumed energy by the end-users, in comparison to the goals of sustainability set by the owner of the company the City of Helsinki and to those of national and international commitments (see chapter 3). Emerging impacts, once the results of this thesis are applied in practice, can be detected and measured though the review of the precise connection between the gained change and the applied means of this thesis is complicated and would require further investigations[9]. The results can be perceived therefore to indirectly contribute to measurable change in terms of sustainability.

9 The quality of the service, including the outcome, in this context better energy efficiency, and the overall service experience, is difficult to measure due to the wide variability of qualitative measures typical for services (Moritz, 2005). The increased energy efficiency should not be achieved at the expense of some other influential element resulting into undesirable overall service experience.

The main limitations next to the outlining occur in the way the thesis supplements the joint venture. Contributions provided by the thesis constitute only one part of the joint venture objectives as the approach is focused on a more limited subject matter within the larger entity of subjects the venture addresses (see chapter 1). The overall approach and values being shared, the only notable distinction can be found in the reviewed time frame as the thesis aims in the provision of solutions to the near future and maintains the focus on the current state of affairs while the joint venture is looking into the time frame of the year 2020 onwards.

Limitations also occur in terms of the targeted results, applied approach and process since only a minority of the questions ideally to be answered within the topic can be addressed. The limitations are basing on the available resources, possibilities of the practical realization and the key areas of business and benefit set by the commissioner.

The thesis aims in answering to the research questions within the limitations of available resources, benefits to the commissioner and the timeframe and possible contributions within the joint venture. The key area under study is the opportunities and challenges of sustainability and service design addressed by providing understanding and recommendations according to the commission of Helsingin Energia.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3 / Service design in a world of climate change

Sustainability or sustainable development and the means of service design and the connection between the two are explored in the following. The issues around current strategies targeted at energy end-users, emerging from the implementation of sustainable development initiated policies and other climate change- driven decision making mechanisms are defined and described. The meaning of these policies and mechanisms are reflected in relation to the energy industry, more precisely the energy suppliers and Helsingin Energia, to recognise the emerging challenges and opportunities. In correspondence to the commission, technology-driven implementations and consumer and user-centric strategies representing energy services similar to SävelPlus are described and analyzed as an example of the emerging opportunities and challenges within the energy industry.

Service design as the second dimension next to sustainability within the subject of the thesis is explored. Service design is presented as a way to tackle the last-mentioned challenges and opportunities and it is defined as the appropriate tool for the creation of energy services. The utilization of service design is justified by describing the value it brings and the way the value is delivered. The approach, methods and process are illustrated and a comparison to more traditional approaches within services is made. The connection between the utilization of service design in respect of current consumer- and user-centric strategies within sustainability is described through the notion of participation.

3.1 Services and sustainability

Sustainability, the ideology or mission fighting against "large-scale urban problems" (Koskinen et al., 2012, 84) first introduced by the World commission on Environment and Development is referred here as the driving force behind the policies and decision making mechanisms described in the following. The realm of sustainable development is viewed as a frame where long-term strategies are compiled and presented by such parties as the United Nations, European Commission and the Ministry of the Environment in Finland. The frame and the strategies are described here as the drivers changing the rules by which energy suppliers among other companies operate in the near future and as a guiding economic force within the energy industry.

Services, as an established academic field in design[10] and a contemporary economic force[11], are referred here as the immaterial products or events experienced in time (Moritz,

10 Service design reached attention as a new design discipline in 2006 in the first service design conference "Emergence" initiated by the Carnegie Mellon University's School of Design (Sanders & Stappers, 2008).

11 Services have a considerable contribution to both gross domestic product and job creation currently constituting approximately 70 % of the total employment and production in OECD countries and the share is still growing (Wölfl, 2005). The corresponding share in Finland is 65 % in gross domestic product (Statistics Finland, 2005).

2005; Design Thinkers, 2011). Services are treated here in a more general level, as a perspective and logic over the traditional way of looking services as a mere economic sector (Grönroos, 2009). The approach, methods and process defined and described are basing on the elements commonly used within service design including the tangible and intangible elements and the way of looking services as complex, customer and user need-driven entities (Miettinen & Koivisto, eds., 2009).

The exploration of issues related to sustainability and the means of service design are concluded in chapter 3.4 by describing their relationship in respect of the energy service opportunities and challenges and by answering to the research question 2 (see chapter 2). The contribution to the main research question (research question 1) is described further in chapter 7.

3.2 Increasing demands within energy industry

3.2.1 Goals of Sustainable Development

Energy has become a problem in Finland. The majority, around 80 % of all Green House Gases (GHG) emitted, consist of CO^2 emerging from our energy sector. Approximately 40 % of those emissions are produced by the energy industry through the production of energy for electricity and heating purposes (Statistics Finland, 2009). Globally compared, the number is high: the corresponding global amount of energy-based GHG emitted by the energy sector is around 60%[12] (Baumert et al., 2005). Heating included into the energy sector, forms the largest share of carbon emissions emerging from housing and services resulting in an amount of 7 % of total emissions due to high indoor space heating demands posed by the climate conditions in Finland and the heavy burden emerging from the fossil fuel and peat based energy production (Boyer et al., 2011). Carbon emissions produced by housing of an amount to over 30 %[13] in the carbon footprint of a Finnish household. District heating, as the form of heating comprising the largest share within all heating forms in Finland, plays an important role in the reduction of emissions within the energy sector (Ministry of the Environment, Statistics Finland, 2009). The way to achieve a low-carbon[14] or carbon neutral Finland is still long for a country with GHG emissions per capita among the highest in Europe (Boyer et al., 2011).

Finland has committed to several policies to respond to the challenge with measures targeting for the year 2020, and suggestions for 2050 (Ministry of the Environment and Statistics Finland, 2009). A quantity of structures, protocols, voluntary agreements, binding directives, recommendations and laws are currently being followed under international and European Union's guidance[15].

12 The factors include energy industry, transport, industry, fugitive and other fuel combustion.

13 www.ymparisto.fi/syke/envimat

14 The Prime Minister's foresight report on long-term climate and energy policy describes the future of Finland as a low-carbon state once reached at least 80 % of reduced GHG emissions (Prime Minster's Office, 2009).

15 The highest international guiding force is the United Nations through United Nations Framework Convention on Climate Change. and from the EU's side the latest regulating framework is the EU legislative Climate and Energy Package adopted in 2008 (Ministry of the Environment and Statistics Finland, 2009).

Energy is one of the key areas under policy making and guidance. Energy efficiency within the scheme of energy is in this context defined as the level of energy consumption needed to provide a given service where the efficiency is in the improvements taking place in the relationship of the consumption and the need. Both the technological performance and non-technological factors such as human behaviour are considered in the improvement of this relationship (Ryan & Campbell, 2012). Energy efficiency thus covers the production of energy and the different forms of consuming energy, including behaviours of consumers and end-users. This broad definition is also used within the policy making, and therefore energy efficiency measures, those targeted to the general energy efficiency and to the building sector, emerge as the most impactful regulatory measures aimed at the energy sector, the consumers and end users, and finally heating.

European Directives[16] implemented in Finland through national legislation[17] and other mechanisms such as energy efficiency agreements[18] address how energy, and energy services and products are produced and how the energy consumption need within housing is to be managed. The directives and regulation translate into obligations for the energy suppliers to provide their customers with broader information on energy consumption, guidance and advice on activities for improved energy efficiency, and tools for the consumer and end-user to measure and monitor the latter (Mäkelä, 2008). In the housing sector again energy efficiency translates into tighter building regulations for both new buildings and renovation construction impacting the energy suppliers with a decreased demand for energy in near future[19]. Major changes, both in the form of restrictions and new options, are about to impact the way the energy sector and the energy industry, municipalities, businesses and consumers and end users operate.

The aims for achieving a low-carbon Finland is leading into a major changes within the energy industry as national commitments are extending their impacts on the product and service offering of energy companies through energy efficiency measures. Customers and end-users of these companies are also impacted and a revision on the energy service offering and main areas of businesses is needed within the energy industry in order to adapt.

16 The referred directive is the European Directive on energy end-use efficiency and energy services (2006/32/EC) including an article number 13 emphasizing the importance of implementing informative metering to enhance improved communication on billing and energy consumption towards the consumer (ECEEE, 2007).

17 For example the Law on Energy Efficiency Services 1211/2009

18 Energy efficiency agreements comprise one form of implementing the EU directives. The voluntary agreements function as a guide for the deployment of energy-efficient technologies and services. The energy industry has their own set targets within the agreements and audits and analyses are conducted to follow the fulfilment of the targets (www.energiatehokkuussopimukset.fi/en/).

19 A goal of 9 % reductions in energy use is set under the European Directives on end-use of energy and energy services for the timeframe between the years 2006-2016. The tighter building regulations, implemented in several phases, is aiming for reductions of 4,9 TWh within energy consumption in buildings by 2020 (Ministry of the Environment and Statistics Finland, 2009).

From energy efficiency to behavioural change
Policies currently aiming at the supply side leave the consumption side in need for other approaches and strategies. Human behaviour has shown to have a considerable negative impact on environment and enhancing climate change (Swim et al., 2009), yet the policy mechanisms are still somewhat supply-side focused and the consumption side is not facing equal attention in the form of regulation or legislation. Currently the measures being introduced to address the consumption-side are thus basing on other premises.

Behind the emissions of the energy sector caused by consumers and users is the habitual behaviour of energy use (Carroll et al., 2009). The habitual behaviour is addressed by changing the behaviours of consumers and end-user through interference. This is conducted by addressing the energy consumption activities by interfering with awareness, attitudes, purchase decisions and even lifestyles (Kaskinen et al., 2009) by focusing on individual behaviours. This approach is called behavioural change and it is being implemented to impact climate change from the consumption side. Behavioural change is enabled by breaking the cycle of habits beyond decision making that are turning into automatic functions when frequently repeated (Carroll et al., 2009). Means to enable to breaking of habits include for example using peer groups, different motives, competitions, personal norms and normative messaging (Carroll et al, 2009; Ehrhardt-Martinez et al., 2010). These different means for enabling behavioural change are borrowing for example from psychology, other social and behavioural sciences and marketing.

The studies so far looking into the different means for impacting human behaviour have shown some positive results (Swim, et al, 2009; Goldstein et al., 2008; Nolan et al., 2008). Behavioural dimensions related to climate change have thus received tremendous amount of public attention (Goldstein et al., 2008) and different strategies are currently being used to implement the set climate change policies.

3.2.2 Technical implementations – The status quo

The emergence of smart metering
Smart metering is one of the technological implementations emerging as the result of applied regulation, simultaneously introducing a new service and product opportunity. It is offering a service with already established characteristics and a platform extended into the homes of consumers and users, ready to be harnessed.

A smart meter is an electronic device measuring the consumption of energy and transmitting the information by using electronic, bidirectional connection between the energy supplier and the customer (ESMIG, 2012)[20]. Smart metering devices or in-home displays aimed at households among

20 No regulative, detailed or concrete descriptions as qualifications are compiled, and the recommendations vary between different organizations and agencies. The Federal Energy Regulatory Commission for example requires the metering device to feature the ability to record the consumption data hourly or more frequently to be qualified for a smart meter (Ehrhardt-Martinez et al., 2010).

other direct and indirect consumer feedback solutions[21] are in practice portable appliances or wall mounted monitors that provide data visualized on a screen, as digital, numerical or graphical information or as coloured light indications (Alahmad et al., 2012). Smart metering information can be found also in online and mobile energy consumption services operating as platforms or digital energy management environments used together with smart metering devices. These services aimed at enhancing energy awareness and informed decisions and change of behaviour differ from more traditional consumer targeted campaigns and other information provision as they are household-specific (Similä & Pihala, 2010). Information on consumed kilowatt-hours and costs, prevailing and future energy prices and environmental impacts are provided as the most typical content (Alahmad et al., 2012).

The attention of the public authorities and the industry is drawn by smart meters since they are currently being introduced into households all over Europe as an answer to behavioural change (Goldstein et al., 2008) and due to the implementation of European Directives on energy efficiency (see chapter Goals of Sustainable Development). The industry is taking part through third-party providers operating in the retail markets or partnering with energy suppliers and public utilities to introduce consumers with new smart metering devices and energy services (Ehrhardt-Martinez et al., 2010). The industry is discovering new service and product development opportunities being provided alongside the

21 Besides smart metering, consumer awareness and behaviour can be impacted through direct programs such as real-time energy metering devices showing the amount of consumed energy (no monetary or other information accessible) or using indirect means such as consumer tailored energy consumption reports provided by the energy suppliers (Carroll et al., 2009).

new regulation (Morch et al., 2007). The implementation of the smart-metering technologies is also seen by the energy suppliers in Finland as a way to provide customers with added value, improved customer service and internal service production (Mäkelä, 2008). Energy consumption monitoring as a new service within district heat for example, is implemented ahead regulation[22] by several energy suppliers in Finland. The services in Finland though mainly emerge as technologically successful yet service-wise poor, web-based applications (Renner et al., 2011).

A need for a deeper understanding

Smart metering devices are one way to make an intervention to user behaviour. Different energy conservation strategies in general, including smart metering and also non-technological, means have been studied along their progression for several decades initiated first time in the 1970's (Abrahamse et al., 2005). In the following the most common means and strategies are described and their impact explored.

The intervention means and approaches are mostly identified to be built from the cost-efficiency perspective with inputs from behavioural sciences (see previous chapter). The most common means consist of provision of information, goal setting, building up of commitment and modelling of targeted behaviours, and the use of different feedbacks and rewards (Abrahamse et al., 2005). The fields of social and

22 The Finnish legislation currently covers only electricity in the requirements of smart metering installations yet 50 % of properties in Finland are already in remote reading (Renner et al., 2011).

environmental psychology have recognised many of these means to serve their purpose though some key areas are yet to be solved. The main issues related to ineffectiveness within the currently applied means are recognised as the lack of persistence in the change of behaviour, and in lack of incentives going beyond the cost-efficiency perspective and the different consumer and user groups not being considered, as they are described in the following.

All the intervention approaches listed above are proven to be effective in the short-term (Abrahamse et al., 2005). Long-term impacts are though harder to achieve: the interest in the feedback wears off (Carroll et al., 2009) and the gained behavioural change is very likely to fade away once the incentive is taken away (Goldstein et al., 2008) for example. The currently used main motivating denominators of monetary and environmental incentives again work only in specific conditions[23] and their appeal is not perceived as absolute.

Integration of insights from social and behavioural sciences, the utilization of social norms, has emerged a way perceived as effective, to enhance the effect of the strategies mentioned above (Ehrhardt-Martinez et al., 2010). Comparative feedback, competitions, implementation of group goals and public commitments are implemented to provide descriptive and injunctive norms[24], resulting in measurably better results in the changing behaviour (Goldstein et al., 2008). Further research and incorporation of social norms is thus suggested as a response for introducing other than non-economic incentives to encourage and motivate behavioural change (for example Ehrhardt-Martinez et al., 2010; Carrol et al., 2009).

The use of social norms together with cost-efficiency- oriented approaches to enhance behavioural change does function as a powerful way of persuasion, though weaknesses and doubt has appeared. The influence on the consumer and the user is argued to be unconscious leading to the causal relationship between the normative messaging and the behaviour, not always being recognised by the consumer and the user. Besides this latent effect, human behaviour has been also detected to respond in an opposite manner to the aimed behaviour once the influence of the normative messaging has been exposed (Nolan et al., 2008). The current research also focuses mainly on curtailment behaviours[25], and therefore cannot necessarily be applied in all energy- related situations. The use of social norms and cost-efficiency- oriented approaches are not thus the only ideal way and therefore new options are needed.

23 Financial incentives for example are effective only when the targeted consumer or user consider prices an important factor in decision making in general. Studies have not shown any difference in impact between monetary or environmental costs as the form of feedback when one of the two has been used (Abrahamse et al., 2005). This could indicate neither of the of two to appear as appealing enough.

24 Social norm is about providing the consumer or user with information or indication on how other people behave in a given situation which influences social behaviour by evoking attractions such as competitiveness and need to identify to others (for example Goldstein et al., 2008;Nolan et al., 2008;Carroll et al., 2009) .

25 Curtailment behaviours in the context of energy conservation refer to behaviours of repetitive efforts to reduce energy consumption such as switching off the lights. Curtailment behaviours are opposite to one-shot behaviours referring to for example the purchase of energy efficient equipment such as heating system machinery, identified to have more influential impact in actual energy savings (Abrahamse et al., 2005).

3.3. Services as the contemporary economic force

3.3.1 The real value of service experience

Service design introduces service experiences and added value. Service design in the context of this thesis focuses on the notion of service experiences and value adding services. Service experience bases on the notion of user experience[26] and therefore delivers to customer and user-centric needs.

Service experience stands for an interaction with a service taking place over time and having the user of the service experiencing sensations both on a physical and cognitive level (Moritz, 2005). The experience is formed together with the consumer and the user and it includes activities and sensations contributing to the usefulness, usability and desirability, the basic characteristics of a service (Miettinen & Koivisto, eds., 2009). Service design focuses on the visible or the interactive part of the service (Maffei et al., 2005), and builds the services always taking place together with the consumer and the user (Miettinen & Koivisto, eds., 2009). The service experience thus focuses on the consumer and the user and takes place as an interactive event contributing through sensations and activities.

26 The notion of experience was introduced in design research in the end of 1990's and the term was taken into use approximately 10 years later as the notions of utility and usability were not considered enough in the field of design research to describe the complexity of human-product and service interaction (Battarbee, 2004). The user experience goes beyond the utility and practical functionality for example by introducing the user as a social being (Suchman, 1985) and viewing the user operating in a social context by responding to values (Battarbee & Koskinen, 2005). The practical and utilitarian needs are thus supplemented at least with social and value-based needs making the experience richer.

Service design and service experiences introduce value. Contrary to the notion of service experience though, value can be produced both to the customer and the user and the organization or the service provider (Moritz, 2005). The value of services from the point of view of the customer and the user can be defined as a benefit, for example in the form of an aesthetic experience or reaching a goal such as arriving at a desired destination or dining at a restaurant. The benefit reaches the value adding status when the benefit offers something to the customer and the user that they feel or are, simply put, "better off" compared to a situation before using the service (Grönroos, 2008). Added value is delivered also through the provision of convenience (Miettinen & Koivisto eds., 2009) and customer relationships (Design Council, 2007). The convenience makes the use of the service more pleasurable and sustaining and building up a customer relationship shows the service provider to be capable of adjusting to the changing needs of the customer and the user (Bain, 2005). The main elements of value adding services crystallize into benefit, convenience and continuous customer relationships.

For companies and organizations, service design brings value in the form of better productivity and the ability to offer better and high-quality services (Moritz, 2005). The value within services contributes both to the customer and user of the service and the service provider, and it introduces a benefit only accessed through the use of the service.

Need for meaningful and relevant experiences
Service experiences and value adding services as the outcome of service design are presented here as an answer to the need for more customer-centric experiences. Service experiences and value adding services can be considered an important asset in the contemporary economy as a way to respond to the ever increasing customer expectations and customer satisfaction (Accenture, 2008), and to meet the need for experiences over utility and practical functionality (Battarbee, 2004).

Customer satisfaction and the delivery of meaningful and relevant experiences have raised their importance in sustaining business performance in the current economic realities (Accenture, 2008). The retaining of customers and attracting new ones is challenging as the customer loyalty is decreasing (Accenture, 2008), and the current realm of customer satisfaction being very poor in terms of how companies are delivering services perceived as valuable by the customers and users (Bain & Company, 2005). The needs behind the offering of products and services are not currently met. The values and expectations are also changing with a rising pace and complexity, making the traditional organizational approach limited (Moritz, 2005) and the use of methods of inquiry on customer and user needs, such as marketing research, are insufficient to capture real customer and user needs (Miettinen & Koivisto,eds., 2009).

Service design and service experience as value adding ways to meet customer and user-centric needs, helps to deliver more customer and user-centric services. Customer satisfaction and expectations can be met and the use of service design can be utilized to sustain the business performance in the realities of contemporary economy (Accenture, 2008).

3.3.2 The designing of services experiences = Service design

The designing of service experiences and value added services is carried out through service design including the process, the outcome and the visible parts of the service as the target of design activities.

Service design, the act of the creating of useful and desirable services from the point of view of the user and customer (Mager, 2008), is about designing complex entities and systems of various details. The details are compiled of different dimensions as layers changing the service operations according to the timing and place, processes and people involved, objects and channels used (Miettinen & Koivisto ed., 2009). Service design is about designing experiences as complex entities seen from the point of view of the customer and the user.

The designing of services can be divided into two main areas to be considered, the outcome of the service and the process through which the service outcome is delivered (Miettinen & Koivisto, eds., 2009). The outcome represents the result the customer and user is provided with in the end of the service delivery process, and the delivery process is about the production and the consumption of the service taking place

simultaneously in time. The referred structure originates from a definition created by Christian Grönroos, presented here as an adapted version by Koivisto (Miettinen & Koivisto, eds., 2009).

Both in the outcome and process the two sides of consumer and the user and the organization as the service provider are considered simultaneously. The importance of the organization within the process is highlighted in the basic characteristics of service design ensuring the service also to be "effective, efficient and distinctive" from the service provider's point of view, besides the more customer and user oriented characteristics of desirability, usefulness and usability (Mager, 2008, 355). All the operations and service activities need to be considered also from the organization's and service provider's point of view. The designing of services includes the service outcome and the service delivery process where both the customer and user, and the organization behind the service delivery are considered.

The designing is aimed at the elements creating the service experience by focusing on the visible part of the service experience (Maffei et al., 2005). The visible elements constructing the basic structure of a service consist of service moments, customer journey and touchpoints. Service moment is an episode where the emerging interactions between the customer and the user and the service provider takes place creating an entity. These entities again form together a larger entity, a customer journey, where the service moments are put together into a chain or a network. Service touchpoints, the smallest element in a service experience, consist of all the different elements creating a service moment, including the physical and the intangible, people, objects and environments (Miettinen & Koivisto, eds., 2009).

Service touchpoints are categorized into channels, roles, procedures and processes and objects. Channels operate as the media for information and interaction. Channel can be a physical or immaterial object, an environment or a user interface. Roles are responsibilities and ways to behave in a service moment divided among the consumer and the user and the service provider in order to produce the service experience. Roles can be unstructured or described and scripted in detail. Processes and procedures are the way or the manner a service is produced and experienced including for example gestures and habits (Miettinen & Koivisto ed., 2009). The elements of a service experience are formed by the visible part of the service taking place as a network or a chain of events where interactions between the customer and the user and the service provider happen.

Designing of service experiences as the act of service design is about organizing the outcome and the process, the visible elements, touchpoints, service moments and customer journey into a complex system. The centre of the system is the customer and the user without compromising the effectiveness, efficiency and distinctiveness of the outcome and service delivery process from the point of view of the service provider.

Delivering value through participative methods
The elements of the service experience are designed through a service design process using a set of methods contributing to the different service design process phases (see chapter 2). The methods originate from different fields of design and from more traditional fields of research, and contribute to different purposes according to the desired objectives. Different types of methods such as traditional, adapted and innovative methods (Hanington, 2003), and generative, evaluative and predictive methods (Suri, 2008) are applied in various different scales contributing to all the different service design phases.

Common to these methods is in the inclusion of the user along the service design process. The purpose is in the delivery of solutions basing on the real, not assumed (Miettinen & Koivisto, eds., 2009), customer and user needs and simultaneously the user is utilized to ensure the creation of the service from the initial understanding and ideas up to the finished service. The users are in this process engaged as co-creators (Grönroos, 2009) into ethnographic and human factors inspired activities aiming for collaboration, dialogue and co-design (Binder & Brandt, 2008), and participation and co-operation (Manzini & Rizzo, 2011). The user can be considered an established part in delivering services (Mager, 2008), even fortified through standardization[27].

The inclusion of the user varies along the chosen method, starting from the introduction of the user as a non-designer, participating in the mere role of consumer and end user not perceived to possess creative skills (Brandt et al., 2010),

27 The connection of user needs and services including interactive systems are also shown through ISO 13470 standardization (Miettinen & Koivisto eds., 2009).

up the presumption of the user as a member in a "socio-material assembly" (Manzini & Rizzo, 2011, 200), where the participation process itself is turned into a design process. An example of a participative method is the conducting of context mapping workshops, and user-centric methods include for example contextual interviews and observation.

The methods for conducting a customer and user- centric service design process are selected according to the objectives at hand. The level and the phase within the inclusion of the user is estimated and the methods and techniques chosen respectively. The use of user-centric and participative methods comply with the established service design field and represent a direction to be developed even further in future (Miettinen & Koivisto, eds., 2009).

3.4. Harnessing the opportunities within sustainability through service design

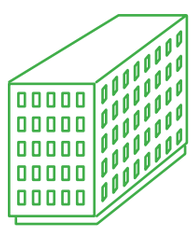
The challenges introduced by international climate change initiated regulation both introduce new product and service opportunities and require adapting from energy companies among other industries impacted by sustainability-driven policy measures. Energy industry especially needs to harness the emerging new business areas and discover new ones, as the main area of business, the supply of energy is targeted with restrictions. The attention around energy consumption and behavioural change again creates new dimensions around customer and user centric thinking, introducing a new different world of with increased importance in delivering valuable customer experiences.

Smart metering and the provision of energy services is for example recognised and utilized as a new opportunity for service and product development. Some of the characteristics introduced along these energy metering- related services and products are not though necessarily representing an appropriate direction in terms of value adding services and experiences.

The partially praised and partially questioned characteristics are emerging from the interwoven regulative and economic agendas, implementing the philosophy of behavioural change and that of cost-efficiency. Strategies and means basing on social norms, appealing on such terms as competition and comparison are used, possibly resulting in unconscious influence. Incentives mainly speaking to the energy users from monetary and environmental premises are again showing lack of persistence in the change of behaviour and ineffectiveness within the incentives, often poorly targeted. The customer and user are approached with the intentions of introducing desirable services yet the way they try to speak to these customers and users is facing debate.

Next to the smart metering and other energy services, service experiences are built through the provision of convenience and desirability (Miettinen & Koivisto eds., 2009), active customer relationships (Bain & Company, 2005; Accenture, 2007) and participation of the customer and user as a co-producer of the service (Miettinen & Koivisto, eds., 2009). The service moments and touchpoints within aim in providing the customer and user with the necessary elements to fulfil their wants (Moritz, 2005), and provide them with something good occurring through the use of the service (Grönroos, 2008).

The agendas of sustainable development in relation to the strategies targeted to consumers and the users described above are found conflicting when compared to the strategies used within service design. The way to approach the customer and the user within the current strategies of energy metering services and within service design, both aiming to value adding services do not meet, if unconscious and possibly negative, socially charged means are placed next to those basing on desire and convenience. This translates to the notion that the current way to approach energy services is not delivering the right value to its customers and users. The growing need to deliver value adding customer experiences needs to therefore use the agendas of service design, and especially that of including and participating users.



4 / Case Kaarikuja 5 and participatory design approach

The practical implementation of the PADR is explored in the following. The realization of the PADR process and the use of selected techniques are described together with a description of the case, the target location and the customers and users within. The realization of the working in the target location of the case, the field, is divided into two phases, the preliminary point of view representing the service provider and the eventual point of view of the customers and users, narrated separately.

4.1 The housing company Kaarikuja 5

4.1.1 The target location

The target location is chosen and the appropriate actor group descriptions are drawn up. The composition of the target actor groups and the target location is compiled according to the commission of Helsingin Energia (see chapter 1). Target location is chosen in correspondence with considerations related to the current clients of Helsingin Energia district heating, general features of the built housing environment and households in Helsinki and the framing project.

The location is an entity of two separate apartment buildings in Helsinki built in the 1967 by construction company Haka during the period of efficient and fast mass construction of the suburbs between the 1970's and 1960's (Heikkinen et al., 2012). The apartment building consists of 144 apartments, houses 244 residents with the share of 10 % tenants and 90 % of homeowners.

Apartment buildings represent nearly half of all heated residential building area[28] in Finland (Statistics Finland, 2009), out of which 97 % are managed by district heating (Statistics Finland, 2010). Apartment buildings also represent the major customer group of Helsingin Energia and the most typical building type among housing corporations, qualifying as an appropriate target. The chosen location is also supported by the joint venture agenda as the target building is located in Kontula, one of the five areas included into the pilot district of Mellunkylä.

The target actors

The target actors are compiled of four different groups representing the resident, the board of the housing company, the property manager and the maintenance man. The ideal target group of residents incorporates both homeowners and tenants. The amount of the members from the board of the housing corporation is included according to the circumstances having at least one member and the chairman taking part.

28 The heated floor area is used here as an indicator due to limited availability of information from Statistics Finland. Cubic metres are usually used as the main indicator when measuring heating within building stock.

Additional conditions for the profiling of the target groups are not compiled, and the more detailed demographic features are naturally determined by to the size of the households, existing life stage within the target location.

The property manager and the maintenance man operating on janitorial activities related to the upkeep of Kaarikuja 5, are incorporated from the local maintenance company providing services for the housing company.

4.2 PADR – conducting participatory design research in the field

4.2.1 The field part 1 – The service provider

Previous User Studies by Helsingin Energia
Previous studies related to district heat services commissioned by Helsingin Energia consist of data from a qualitative user research[29] conducted by Kimmo Rönkä and Vesa Kemppainen from design consultancy Movense Ltd. The data of the study is basing on contextual user interviews accomplished in 2009 with actors from all Helsingin Energia's customer segments. Amongst other suggestions presented in the results, the directions incorporate the suggestion for developing heating and energy consumption monitoring services as a way to better involve residents. The study both operates as one of the initiatives for the thesis and provides insights that indirectly concern the subject matter. The research is used as the base data for the context mapping as the results are studied and relevant insights are discovered.

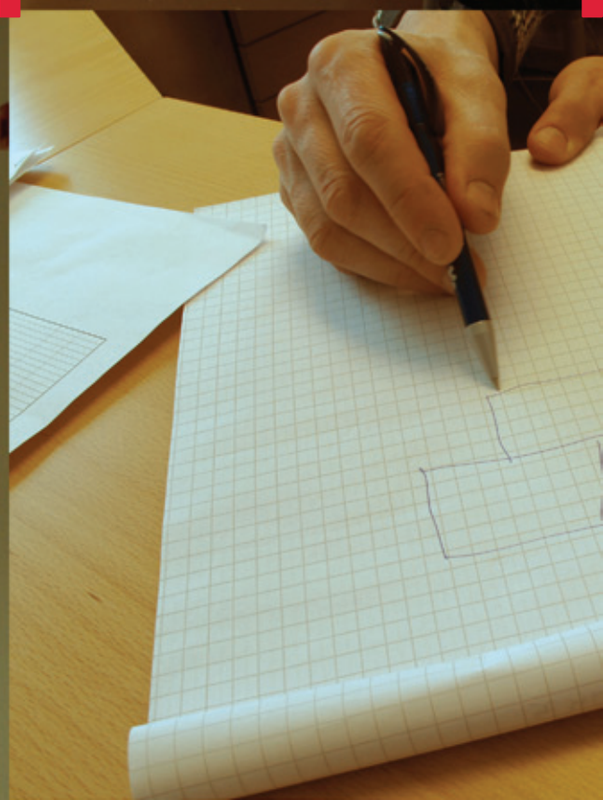
The most relevant consideration in relation with this thesis emerging from the research is that of support for discussion. The study of Kemppainen and Rönkä shows that district heating services consists of too technical and professional vocabulary whereas the users are more likely to identify with stories. A need for support for enabling discussions with all actors exists. The insight, support for discussion, is thus taken into consideration in the planning of the research activities.

Mapping the context of the service provider
The mapping of the customer and user-centric insights is begun by looking into the context of the service provider. Existing behaviours and situations, related to the service production within the line of interaction towards the customer and the user of are mapped by conducting a set of contextual inquiry activiteis with the personnel of Helsingin Energia. The results are analyzed and a preliminary idea of the current service context is formed.

The contextual inquiry is conducted in the form of contextual interviews and still documentation. The technique, originating from ethnography, combines interview structure and observation through beforehand selected, rough set of open

29 The research was commissioned for internal use for Helsingin Energia and it has not been published. The content of the research however was released from any original requirements of confidentiality to the use of this thesis and it has been already used in workshops as part of the joint venture material. The results from the research can be enquired from Helsingin Energia.

The interviews for the first information gathering were conducted in Sähkätalo, the headquesters of Helsingin Energia in Helsinki.



questions[30]. The aim of the interview is to help engage with the interviewee and uncover conscious and latent needs (Moritz, 2005) related to the daily work of the personnel and the service context. Attributes featuring the method of the five why's[31] are utilized in the interview situations to gain understanding with the root causes of behaviours and situations described by the interviewees.

Five interviews, lasting one hour and 30 minutes each, are carried out involving five members of the staff. The interviewees are selected to cover different areas of expertise around district heat energy consumption monitoring and customer service in general including an engineer involved in the development of the current SävelPlus- service, a sales assistant, a person in charge of the technical maintenance, a person in charge of invoicing and a person working in the call centre receiving the primary contacts from the end customers. The interviews are documented using a voice recorder and a camera for which each interviewee is asked to sign a consent form to allow the use of the gathered material. Key notes are captured already in the interview situations to enhance the analysis phase.

The questions used in the interviews represent four areas of inquiry: general drivers and hurdles, activities, actors and touchpoints emerging in the daily work of the interviewee. The raw data gathered from these interviews, including pictures, notes and other material is analysed by grouping and arranging the material into themes and by looking into connections between the formed groups.

30 The list of questions functions as a protocol where the boundaries are set loosely as wide range of topics can occur during a contextual or an in-depth interview (Wasson, 2000)

31 The five why's is a method where an answer given by the interviewee is responded with a question "why" after each given answer to gain a deeper understanding. The method is used for example by the National Health Service in England for preventing hazards of transfusion (Gerrard, 2006)

A point of view of the service provider

Gained insights from the preliminary idea of the service context consist of subject matters such as the customer relationship, role of the service provider, the emergence of district heating in the context of the customer and the user, the role of a single resident and the social context of the customer and the user. The subject matters both operate as the basis for the questions to be used in the second part of the field work and the as overall insights to be taken into the target location, in the context of the end users and actors, to be tested. The insights 1-5 are described in the following:

1 The housing company is a social community with complex structures resulting in different formations between individuals and groups impacting the activities around energy consumption monitoring

2 The resident can be activated through by identifying the existing skills, personal motivation and by clearly presenting the demands and the commitment

3 The customer relationship between Helsingin Energia and the client is not functioning properly since all positive service activities are hidden and the visible activities conducted by the service provider often emerge as disturbances, also the roles, responsibilities and commitments are unclear between the two sides

4 The role of Helsingin Energia consists of providing guidance, being present and managing several service activities. General mistrust towards the role and status of Helsingin Energia also exists from the side of the client

5 Heating is mostly perceived invisible by the customers and users, the consumption of heating is perceived as abstract and not understood as it is not personally targeted and lacks tangibility, costs and consumption of heating are seen as equally measurable

Questions to the field
The last-mentioned insights are reviewed together with Helsingin Energia and a set of questions is compiled to be used in the second part of the data gathering. The insights are addressed partially according to specific emphases directed by the Helsingin Eenrgia, and the focus of the study is adjusted basing on the initial objectives as well on the new understanding.

The parts possibilities for activating the resident, the housing company as a social community and means for representing and measuring district heating are included in their entirety. The part customer relationship is addressed through only one specific service activity currently provided by Helsingin Energia, not included into this thesis report[32]. The part Helsingin

32 The research question was addressed to a specific service activity, not included to the topic around energy consumption monitoring but to other, facilitating services offered by Helsingin Energia and therefore it was left out of this thesis.

Energia has a role is omitted as it addresses subject matter too broad to be studied in the context of this thesis and as the topic reaches outside the initial objectives.

Questions basing on the findings from previous studies commissioned by Helsingin Energia as additional and supportive questions, also the background issues within smart metering of energy are considered. The chosen questions are described in the following:

1 How the social community could be utilized?

2 How a resident can become active?

3 How district heating can be represented and measured from the point of view of a resident?

In the following the chosen additional and supportive questions are described:

How can discussion and routines be supported?

How could heating and energy consumption monitoring be motivated in the long term?

How could heating and energy consumption monitoring be made interesting?

4.2.2 The field part 2 – The user and the actor

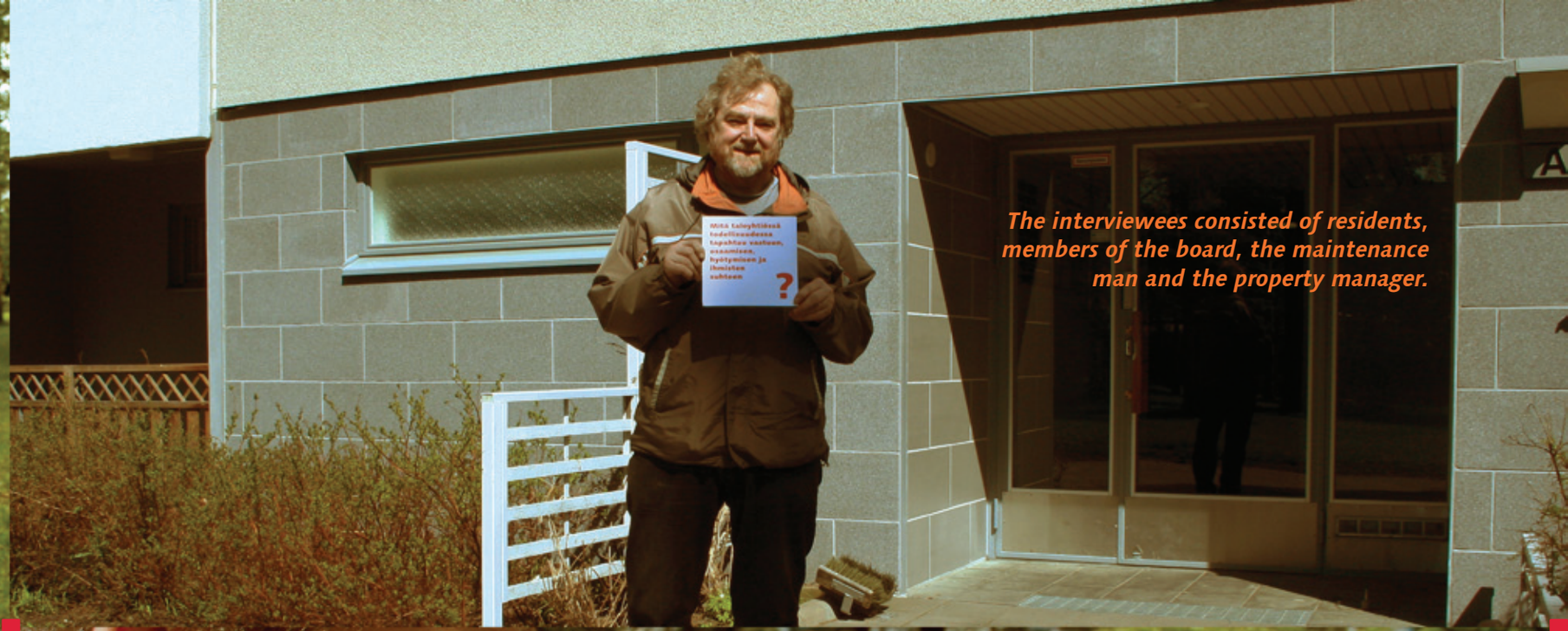
Conducting the PADR - Working in situations
Customer and user-centred approach, the process of PADR and the use of the different variables and dimensions of service design are implemented fully in the second phase of the information gathering. The process and the techniques are prepared to conduct the inquiry of the selected questions in the context of the target location, Kaarikuja 5.

On top of techniques, a collective mindset is chosen as the overall guidance to manage the fieldwork process. The mindset is about working with situations which refers to the way how all the encounters with the actors, both actual ones and fictive ones being thought through before the actual encounter, are pictured as detailed narrative-like situations. The understanding of the people is made by understanding situations in the context of ethnography and design, and the knowledge can be searched in the relationships between the people and the situations (Binder et al., 2010). This is applied in practice by approaching the actors having the focus in the situation where the actor is found: all research activities are targeted to specific situations.

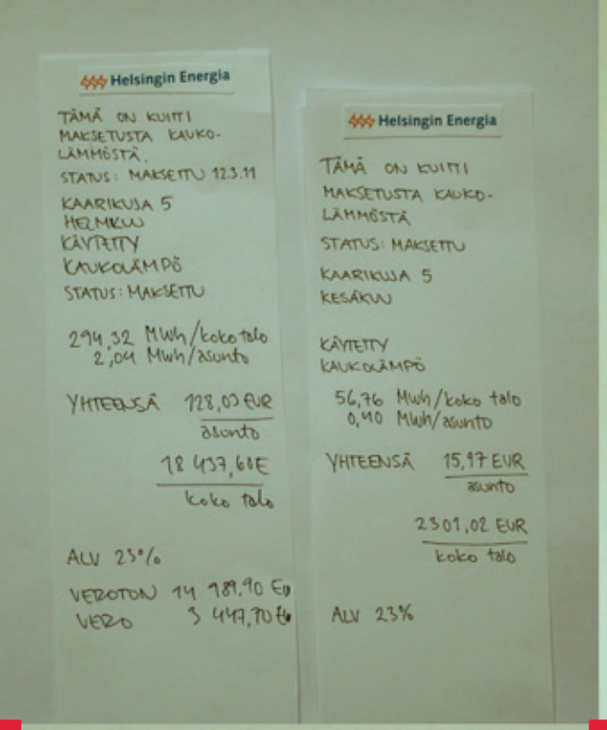
Gaining understanding through prototyping
The gathering of information in the situations is conducted by using prototypes and mock-ups contributing to the exploration of interactions, and characteristics and the appearance of design solutions (Binder et al., 2010), and to create dialogue between designers and non-designers (Brandt, 2007). The prototypes function in the context of the field as practical tools to carry out the interventions described in the process of PADR (see chapter 2). The tools are not used only to collect information in comparison to the first field activities, but to create a continuous loop of problems and solutions, also referred as a strategy of "generative prototyping" (Binder, T., Brandt, E., Clark, et al., 2010).

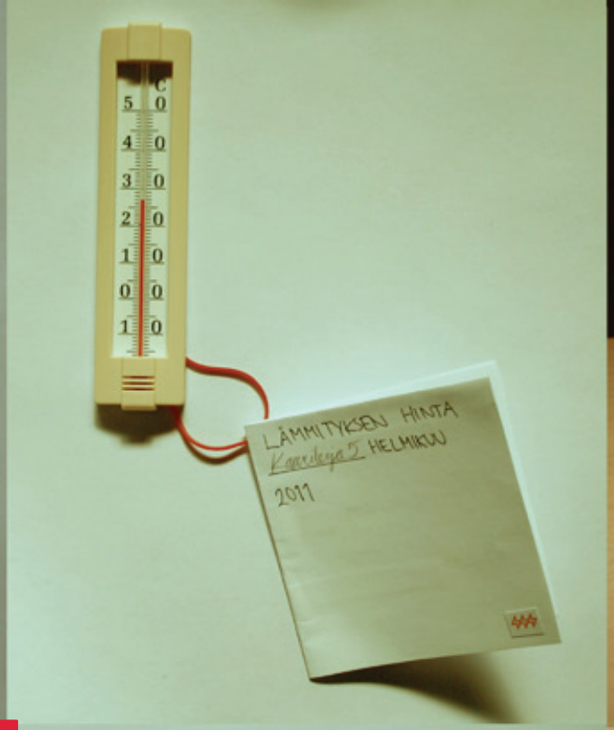
The choice of tools and techniques always contributes to a specific purpose, emerging in a specific form and being used in a specific context while conducting a participatory approach (Binder at al., 2010). Encounters in the context Kaarikuja 5 serve primarily both the purpose of priming the actors and gaining understanding. The use of the prototype taking place in a dialogue between the designer and the non-designer, the first purpose is in the priming of the actors and interviewees encountered. This is carried out by having the prototype performing as a physical metaphor reflecting the subject matter and the research question at hand. The dialogue is taking place as a social process between the persons, where the introduction of mutual vocabulary and the use of visual appearances easy to relate to, enhances the understanding (Luck, 2003). The prototype is therefore used to support the interviewing of the actors, enhancing the social interaction of the situations.

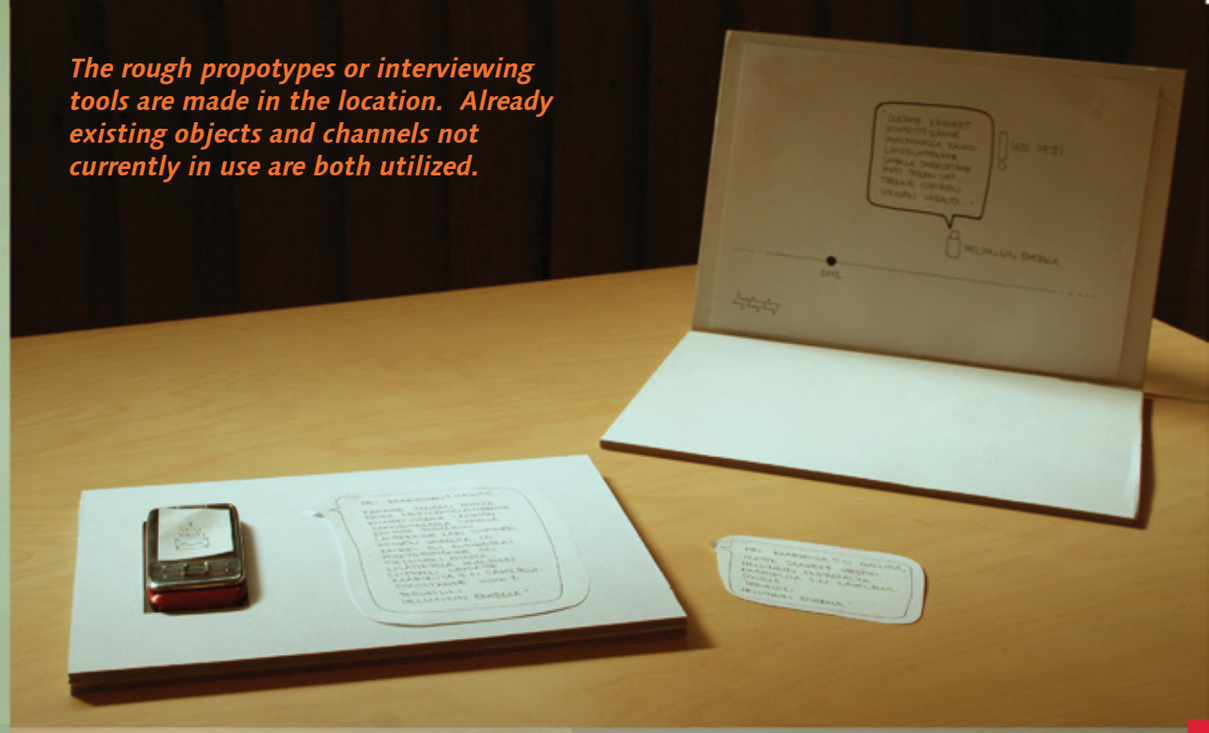
The second purpose of the use of prototypes is to reflect the service dimensions of the information gathering. The complex nature of services (see chapter 3) is more easily interpreted by using tangible objects that both reflect the subject matter and questions at hand, and also provide a point of reference



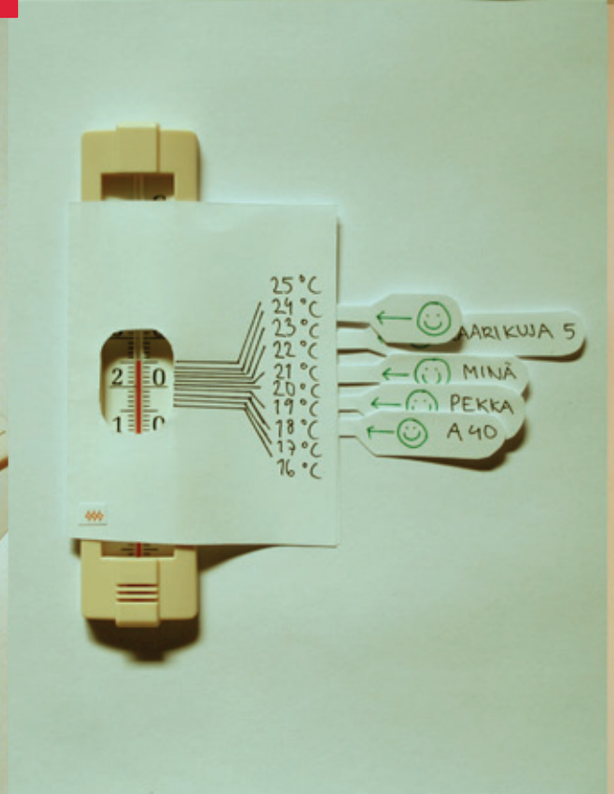
The interviewees consisted of residents, members of the board, the maintenance man and the property manager.

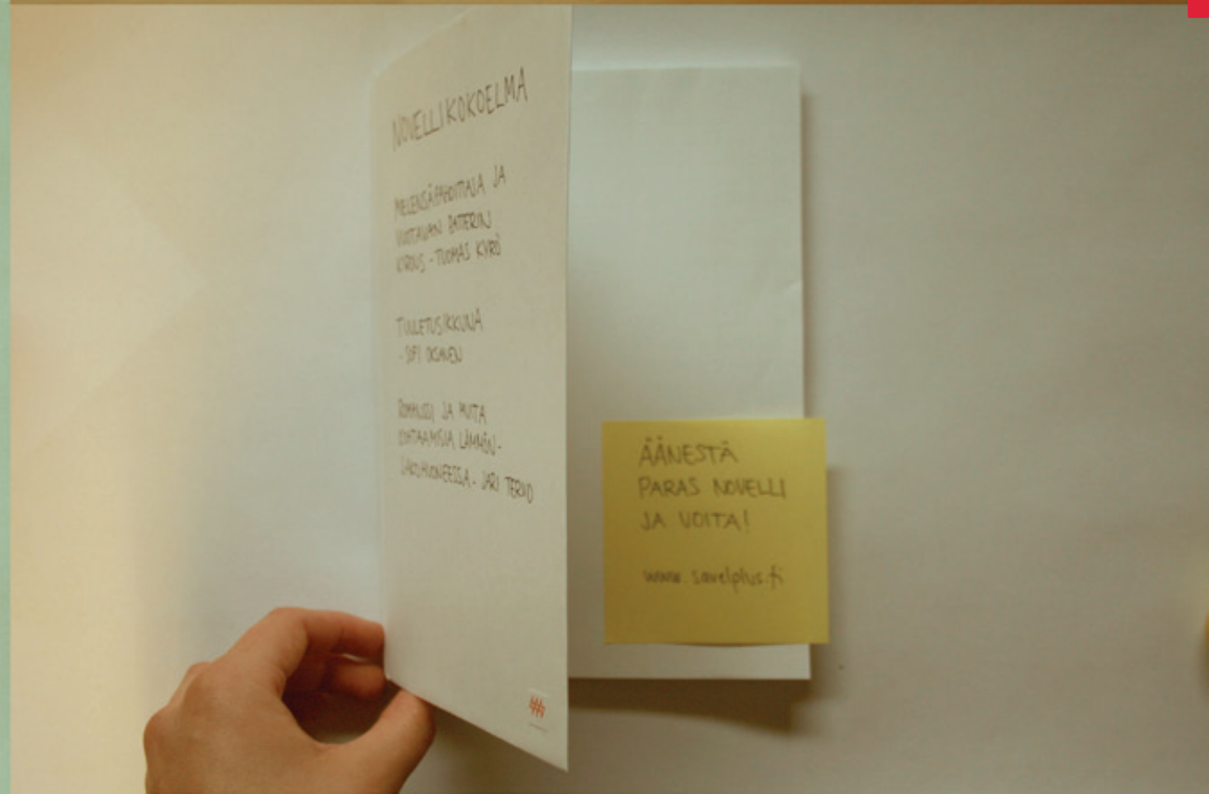






The rough propotypes or interviewing tools are made in the location. Already existing objects and channels not currently in use are both utilized.





for the emergence of different service touchpoints such as the use of different channels. Brandt refers to prototypes or mock-ups as "things-to-think with" allowing the user to interact with a suggested solution (Brandt, 2007), applied also in the realization of the field activities.

The prototypes or mock-ups used in the field activities are rough three-dimensional tools built in the target location supported with drawn scenarios[33] to provide an adequate level of understanding. The prototypes used are simple, made fast and out of inexpensive, also referred as low-fidelity providing a limited demonstration about an artefact, product or service (Preece et al. 2002). The simplicity is aiming for the prevention of having the interviewee's attention on a too detailed level which could lead to a smaller variation in the responses and prevent unexpected issues to rise (Brandt, 2007). The situations again for using the tools are planned to take place as face-to-face meetings with the participants, mostly arranged as sessions with maximum of two actors at a time to ensure the capture of individual expressions (Binder et al., 2010).

One month, four phases and six steps

Compilation of the timetable and working procedures for the field are the most important part of the preparation. The four stages of the PADR (see chapter 2) require continuous flow between all the stages and on the other hand a clear timeframe to provide a clear beginning and ending for the process. The process is therefore taken into practice through an intensive one month timeframe for all research activities to be completed. The fieldwork in total consists of one week preparation work and four weeks of field activities, all carried out in the target location. All the questions are processed by dividing each question to be addressed in a specific timeframe of 2-4 days within the four weeks.

The practical preparation consists of finding the appropriate people to contact, communicating ahead the residents and arranging the working space within the target location and creating the needed materials. The aim in the preparation is to enable to working space to be accessible by the actors of Kaarikuja 5 at any time within office hours and while the research activities are taking place. The actors are approached and motivated to take part by using compensations, a way to efficiently engage people in a short timeframe, as stated for example by service design consultancy Engine[34].

The working procedures are planned to meet the set timeframe for each question. The working is divided into six different steps that are compiled into a practical guideline, functioning similarly as a question sheet during the contextual interview. The working begins by conducting the first phase of the process, problem formulation and choosing an appropriate situation for the research question. The situation is viewed through a service point of view, and at least one touchpoint is chosen for prototyping. The situation is also described

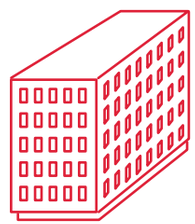
33 The scenarios or more accurately use scenarios, are drawn representations of the users, the context and a specific scheme, used here together with the three-dimensional prototypes to illustrate design suggestions (Heinilä, ed., et al., 2005).

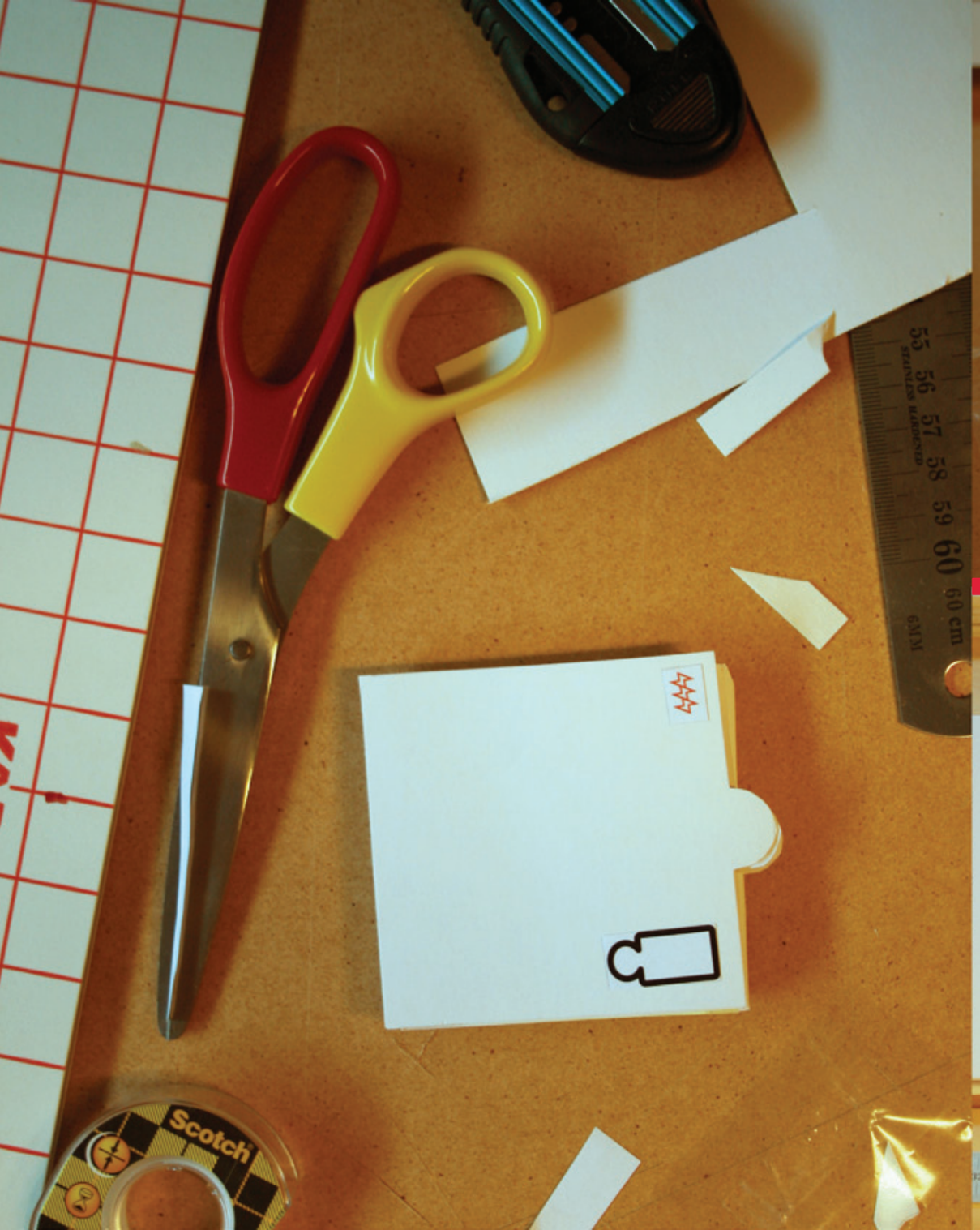
34 www.enginegroup.co.uk

verbally if needed or by using other visuals, and prepared to be tested for the second phase of intervention. The actor is asked to try out the prototype during the intervention, and further questions[35] are asked to receive an understanding. Reflection and preliminary learning are conducted once the intervention is over and the prototype or the overall situation is modified if needed, according to the response of the actor. The intervention is again conducted with another actor until the fourth phase of formalization of learning can be done (for the process phases see in chapter 2).

During all research activities conducted in the target location, reporting on a weekly basis is made to the team within Helsingin Energia to inform the proceeding of the field work and to address possible needs for readjusting the directions of the field work.

35 Features from the method of contextual interview and the technique of five why's are applied to support the gathering of understanding, see chapter *Mapping the context of the service provider*.

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5 / Visualizations on energy consumption activities

The results described in the following consist of the insights gathered during field activities of the case. The insights include the description of the current energy consumption activities in the target location, and the discovered main issues related to the activities within the target location. The description of the most important insights is supported by using service process visualizations that illustrate of the chain of activities in the context of energy consumption monitoring, viewed as simplified visualizations of Service Blueprints (Shostack, 1993). Both in the insights and visualizations, the perspectives of the service provider and the actor or customer are both displayed through fixed time frame. The results operate as the starting point for the recommendations to be discussed in the chapter of Discussion.

5.1 Insights - How does energy consumption monitoring function in Kaarikuja 5?

The following insights describe the system of energy consumption monitoring formulated by the target actors in the target location. The community of actors and major events and features within the consumption monitoring created through interaction between the different actors, are also described. The main insights including both social and functional dimensions are composed of the general perception on heating consumption, the social context of the events, ways to perceive the monitoring as the primary phase of the experience and ways to act in relation to the monitoring as the secondary phase of the experience.

The energy consumption system is also described from service design point of view having the drivers and hurdles related to the most relevant touchpoints included into the insights.

Key findings show a division between passive and active as all relevant actors are not being included into the monitoring activities and some important ones being only indirectly part of the monitoring system. The general perception around heating suggests that the consumption of energy is about managing a static circumstance, currently demonstrated from the point of view of a resident with relatively one-sided set of factors. Interaction, the way how heating consumption is seen and how the consumption is being controlled by the different actors, manifest two separate conflicting realities: residents see and operate in the way currently natural in their context whereas the active actors in the energy monitoring, the board of the housing company, the maintenance man and the property manager, operate from completely different grounds.

5.2 Kaarikuja 5 – Actor groups of energy monitoring

5.2.1 Actor groups

The most relevant actor groups are defined and described in the following and the titles are used to refer to the actors throughout the parts, insights and recommendations. The community of the target location consists of residents, members of the board of the housing corporation formed by residents, and the personnel of the maintenance company. The residents are divided into different groups in terms of decision making with the primary decision making power being represented by the board of the housing corporation.

The first actor group is referred as the board. Distinction between the different roles within the board, such as the chairman or the secretary is not made. The actor group taking part into the decision making[36] is referred the owners consisting of shareholders. Occupants consist of tenants and those shareholders who have signed away their authorization for the vote (1599/2009, Ministry of Justice Finland, 2010). Shareholders not living in the target location are referred here as remote owners.

36 Taking part into decision making refers to the possibility for a shareholder to use their vote in the official housing corporation meetings.

The actor group maintenance company includes the actors of maintenance man and the property manager both belonging to the community of Kaarikuja 5 and at the same time representing interest group- like an actor from the service provider's point of view.

The service provider, Helsingin Energia and other housing corporations form the last actor groups being only indirectly part of the community.

Who is active?
Actors directly impacted by energy consumption monitoring are the board, owners, remote owners, occupants, the maintenance company and the service provider. Actors actively part of the monitoring activities are though only the board and the maintenance company (picture 4).

The role of the service provider is currently in the provision of the core service, the supply of heating, and facilitating services such as invoicing. SävelPlus as supporting service is not being actively utilized in the community by any actors.

The role of other housing companies, mainly those from the near area, is to function as an unofficial reference point and as a source of information.

The most substantial actors, residents are mostly left passive, outside any monitoring activities.

How the consumption is being monitored?
The dynamics between the actors, both passive and active, can be described through actions and decision making in the community.

The service provider is passive from the customer's point of view and all service interaction is passed on through the maintenance company: for example invoices and consumption reports are directed to the maintenance company's office. Helsingin Energia has not got on the other hand any service activities aimed at maintenance companies who rely on their own systems in energy consumption management.

The maintenance company in contrast to Helsingin Energia functions as the main information holder by directly supporting the community: all energy-related decisions and procedures alongside the building's energy consumption are recorded, and guidance is actively provided. The maintenance company is also at the very heart of energy monitoring activities by carrying out all the energy-related practical procedures.

Residents rely on the board for example in terms of information access and need to be supported in all resident-related energy consumption activities.

Monitoring as a system
Actors and the target location form together a system, an entity of complex interactions connected to each other (Moritz, 2005) that can be examined from a service design point of view as process visualizations demonstrated in pictures 7-12 and in the following chapters.

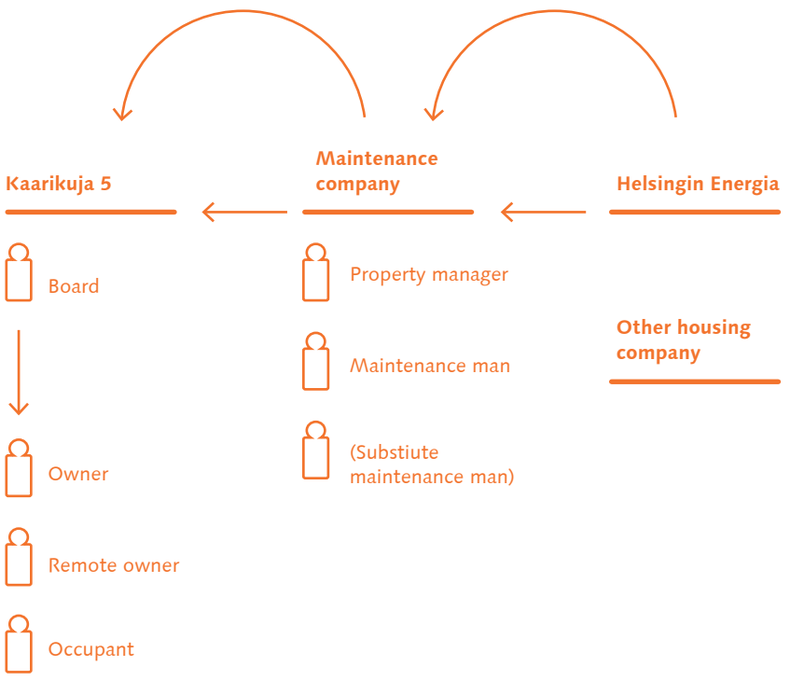
5.3 One heating consumption, two realities

5.3.1 A shared circumstance

Heating is a coherent whole
Heating stands for comfort in housing and indoor circumstances from the resident's point of view, where as in the eyes of the board of the housing company, heating translates into a financial and technical factor and a permanent element in the economy of the property of Kaarikuja 5. The maintenance company again finds heating part of the property's ongoing maintenance and repairing activities. All three parties find heating as something static and therefore it can be regarded as a circumstance rather than a quantitative or tangible matter being consumed, thus energy consumption monitoring can be translated into monitoring a circumstance.

The circumstance of heating is experienced as a whole though the way it is currently presented and managed is fairly restricting compared to how the whole is seen by the actors. Residents for example experience the circumstance of heating as the sum of financial costs, the amount of energy consumed, environmental impacts, saving measures[37] and comfort in housing, none of them suitable for evaluation as a single and isolated factor. Yet comfortable housing or saving measures are not included as factors in energy consumption management. Inside temperature for example, the most natural indicator in the context of the resident, is missing from the current palette

37 Saving measures refer to actions supporting daily efficient energy use and also measures in the long term such energy renovations where the actual saving includes both investments on the energy saving measures compared to the gained benefits.



Picture 4. Actors who are actively part of the monitoring in the community.

Board > Residents:
Informs
Comments
Guides
Answers to questions
Checks
Participates into meetings
Decision making

Residents > Board:
Asks questions
Comments
Participates into meetings
Participates into decision making (owners and remote owners)

Residents > Maintenance man:
Fault announcement
Asks questions
Comments

Maintenance mans > Residents:
Fixes faults
Checks
Answers questions
Advices

Property manager > Board:
Compiles documents
Participates into meetings
Guides
Information holder
Shares information

Property manager > Residents:
Participates into meetings

Maintenance man> Board:
Records consumption figures
Monitors the heat pump and the target location
Reports
Carries out practical procedures

Helsingin Energia > Maintenance company:
Invoicing
Shares information

Kaarikuja 5 > Other housing corporation:
Occasional shared meetings
Information share

of measures. The representation and comparison of the already existing data and indicators displayed through technical diagrams and figures, is again often found too complicated and difficult to understand.

Limitations from the point of view of the board are found both in the comparison, representation and as missing measures. The maintenance company again does not possess all technical abilities and on the other hand, justifications for the production of data beyond their main area of responsibilities do not exist. The information provided by the maintenance company does not include ways to measure comfort in housing and the scale for comparison does not feature other housing companies, such as those from the nearby area currently used as unofficial points of comparison. Representations for the environmental impacts are missing from the measures provided by the maintenance company, though the information offered by the service provider is anyway found difficult to understand.

Managing heating consumption information as a whole from the side of the service provider is limited as the current SävelPlus does not include all features needed by the Kaarikuja 5: different actors are not acknowledged and comfort in housing is not included as a measure for example. The production of the information into SävelPlus does not capitalize on all information potentially available due to internal processes, as the information is either hidden in other internal support systems or accessible through interest groups in the form of cooperation.

Picture 10. Annual reports on energy consumption forecast and realized consumption sent to customers by post base on figures represented by different information systems than what is seen by the customer when independently accessing the current SävelPlus- service. The difference in the visualization logic and aesthetics create confusion and inconsistent experience on energy consumption monitoring services.

Disunited by the actors

Heating as a shared circumstance occurs as an entity also in terms of technical features and principles set by the district heating system. The primary unit, the property, and the apartments representing the units of the residents, are connected through physical heating network piping which creates a system with interdependent parties: activities taking place inside the apartments impact the entire property and vice versa.

The property is represented by the active actors within energy consumption monitoring, the board, the property manager and the maintenance man, and the smaller units, the apartments are represented by the residents. These parties form the two opposite sides currently perceiving the heating circumstance, the whole, in two conflicting ways. The conflict emerges in the way how heating is seen and controlled, and through the social context, the interaction between the actors.

Insights on the two conflicting realities are described in the following chapters through the themes of perception, action and interaction.

5.3.2 Community = Interaction

The main problems in the interaction are in the lack of resources and tools for managing the communication and the emergence of feelings of unease and insecurity in pursuance of different encounters between the actors.

The board "holds the key"
The board holds the main responsibility in supporting the residents as most of them are mainly passive and expect guidance. The members of the board are though currently unable to control the interaction between them and the residents as the amount of the residents compared to that of the board exceeds the available resources. The lack of means for predict and control communication leads to un-efficiency and problems: each resident need to be handled at a time and the communication easily turns into an unpleasant workload. Residents on the other hand no other way to make a contact but to approach the board directly.

Picture 12. Shareholder's meeting and the meeting invitation are the only official linkage between the residents and the board for sharing heating and energy consumption-related information and participating in the discussions. The meeting is held once a year where as the board and the other active members within energy consumption monitoring share information and discuss on monthly basis. The property manager encounters problems in time management and has usually no time to face the residents for a talk in the shareholder's meeting.

A filter is needed between the actors
The encounter between the actors leads to a collision of personal needs and the democracy of official housing company matters. An issue handled in the level of official decision making turning into an emotional personal issue is a threat experienced by the board, the property manager and the maintenance man. The residents on the other hand find it difficult to approach the opposite side with questions or concerns as their starting point is every time personal. Insecurity caused by the prevailing necessity to expose one's identity between the actors in relation with concerns and decision making emerges as one of the main problems: the focus of the interaction is in the persons behind the communication rather than in the topic.

Picture 12. Addressing the board and the other residents by using one's real name can turn out as a barrier preventing any discussions to build up.

The discussion is lost
Discussions around heating circumstance are lacking the natural timing, place and role in the decision making of the housing company. The power and meaning between official discussions and unofficial ones is also confusing among all the actors as the limit between the two is sometimes hazy. The board is in need of tools to manage and support the discussions since that way they are able to appropriately utilize the communication in the decision making. Interaction between the residents and the maintenance personnel

again needs to be managed to restore the initial role of the maintenance man as a neutral messenger between the decision making of the board and the response of the residents.

Picture 11. Keeping up a neutral role with the residents when visiting an apartment due to a maintenance visit, can turn out challenging from the maintenance man's point of view.

The service provider is missing
Service provider does not have a relationship in terms of active and regular interaction between any of the actors in the context of energy consumption management of Kaarikuja 5. Lack of interaction is due to missing shared touchpoints for the actors to contact the service provider and vice versa (pictures 9-10).

Need for safety
The actors are not all able to participate into the social interaction around energy consumption monitoring, the lack of control within the interaction among actors and the missing time and place for discussion. Need for control and feeling of secure over feeling exposed are needed to support discussion and social interaction in general.

5.3.3 Two different perceptions

Activities and phenomena related to the consumption of heating are partially invisible between the actors, and also between the actors and the service provider impacting awareness and decision making.

Measured versus experienced
Heating and the consumption of heating appear either as a personal sensation or as a measured figure. The board, the property manager and the maintenance man perceive heating as a neutral and technically measured and defined figure, as a level of indoor temperature, reviewed and set according to technical information. The economic-technical value of heating is well acknowledged in detail and decisions are based on this value. Residents again are not well aware of the financial value but they perceive heating as an experience on the physical sensation of the indoor temperature, used to evaluate the comfort in housing. All these personal perceptions on the suitability of the level of the heating, representing all the residents, are not included together with the economic-technical factors. The actual value of heating is thus not known by any of the actors of Kaarikuja 5. The decision making around heating is therefore composed of a compromise not taking into account all relevant factors and is not collectively agreed by all the actors.

Apartment as the line of visibility
Perspectives of the residents and the opposing side are mostly invisible to each other having the apartments functioning as the determining line of visibility. The board, the property manager and the maintenance man observe heating only on the level of the property meaning: indoor temperatures, experiences on them and activities done in each apartment are currently invisible which leads occasionally into situations where changes in the consumption figures cannot be explained. Residents again experience the indoor temperature and other heating related information to miss a point of

comparison. Information concerning other apartments, such as the temperatures, is not accessible and the information given on the level of the property does not provide an overall picture: for example the heating-related information does not provide understanding on, what does the existing temperature level mean financially and comfort-wise in the context of a single apartment. The apartment functions often also as a barrier in terms of communication , even though heating-related matters are not considered too private to be shared.

Picture 11. Residents do not every time contact the board or the maintenance company regardless of their indoor temperature in the apartment being experienced too high or too low. The only way currently to make the indoor circumstance visible outside is mainly through a maintenance request or by contacting directly the board.

The maintenance company and the service provider
Perception on the heating consumption from the point of view of the maintenance company is currently restricted as the tools used do not include ideal amount of technical measurement abilities (picture 8). All indications on the functionality of the machinery cannot be detected since either of the system used by the maintenance company or SävelPlus do not include inclusive set of digital measures and alarms.

The visibility between service provider and Kaarikuja 5 is also limited. Service activities ran by Helsingin Energia are mostly invisible and due to a lack of active interaction between the customer, crucial information on heating-related activities managed in Kaarikuja 5, are out of reach of the service provider: renovations impacting energy consumption or energy saving measures are invisible. Awareness on these activities is crucial to detect possible faults and the better knowing of the customer is evident in the provision of possible new services.

Picture 9. Regular check on the customer's energy consumption figures conducted by the service provider every two months is carried out every time as an invisible service activity. The customer is contacted only in case of deviation referring to a possible technical fault.

Need for better relatedness
The current situation in regard to the visibility makes the actors unable to relate to the overall situation over heating consumption. The lack in points for comparison, easily relate to, makes heating unintelligible and decision making and introduction of awareness difficult.

5.3.4 Two different ways to control

Actions and behaviours related to the ways to manage and control heating consumption differ between the actors. Efforts in trying to adjust the heating and to be able to control it independently, impacts the feeling of autonomy and being competent.

Apartment = resident's interface for heating
The two different perspectives shared by the residents and the board, the property manager and the maintenance man, are the main differentiating aspect for controlling heating. The last-mentioned ones observe and act towards heating always

from the perspective of the entire property where as the apartment is the only understandable context for the resident. The apartment as the context of heating, consist of devices such as the radiator and the thermometer or toucpoints such as the window functioning as the only possible mechanism for adjusting the consumption of heating. Lack of knowledge, poor usability, insufficient readiness for measuring the indoor climate and incorrect use of the devices and touchpoints though currently lead to un-existent control.

The board, the property manager and the maintenance man perceive the target of the control being the property where the radiators of the apartments are the continuation of a centrally controlled heating system, usually consistently adjusted only in pursuance of renovation activities. Individual radiators in the apartments are intervened only occasionally, and consistent guidance on the use of the devices and the touhcpoints of the apartment is not conducted as the lack of knowledge within the residents is not known.

Picture 7. The energy report provided by the maintenance company makes energy consumption information visible on the level of the property where as ways to measure or interpret apartment level circumstances are not currently available.

Adjustment both brings and takes away control
The experience of control is either decreased or increased by the possibility to adjust. Control from the point of view of the property is about aiming in unsubstantial need for adjustment, currently difficult to manage. The resident again expects

personal control over heating and assumes it to be easily and quickly adjustable which currently results in un-efficient use of heating, through actions such as constant airing using the window instead of managing the radiator.

Under control or not
Activities and procedures aimed at controlling the heating are not equally in line in the context of the apartment and the property. Residents are making efforts in trying to manage the indoor temperature in their apartments with insufficient information and with difficulties to observe any changes accomplished through these efforts, asserted by mistrust to the decision makers. The board, the property manager and the maintenance man on the other hand experience to be mostly in control: decisions and procedures are made within the decision makers suitably, requests by the residents are considered and the consumption of heating is being monitored.

Picture 11. Resident can feel powerless and even suspicious when the maintenance man visits the apartment to check the indoor temperature from the request of the resident. General unawareness on decisions made by the board or general lack of information on ways to impact indoor temperature as a resident, often heightens the mistrust.

Forethought in order
Forecasting and planning of future energy-related renovations are full of difficulties one being the lack of means to initiate collaboration between housing companies playing

an important role in economicly and quality-wise viable renovation projects. The major challenges found are in the proactive recognition of renovation needs, for example uncomfortable indoor temperature expressed by residents, and in the introduction of different alternatives, often found difficult to approach by the decision makers if any budgeting for example does not exist to start the planning with.

Need for independent and more precise control
Residents do not perceive to have any control over indoor climate conditions and comfort or to be able to independently act to be in control. The board, the property manager and the maintenance man again find it important not to lose the existing experience of being control. Forecasting and proactive preparation for the future would provide even more control, especially over time.

5.4 Processes, channels and roles

The insights described in the following are seen from the point of view of service design are divided into processes, channels and roles described here as drivers and hurdles to be considered in the way how future service activities are fitted into the context of Kaarikuja 5. Description of the processes and channels appearing within Kaarikuja 5 are also found in picture 5-6.

5.4.1 Processes emphasize human interaction

Experience of presence is found important and it emerges through two-sided and active communication (picture 5), visual and functional references (picture 6) and through building up a trustworthy human interaction. Time and rhythm is needed in this interaction, and it functions as the primary indicator for the routines and is adopted and adjusted according to other everyday activities such as seasons or yearly or monthly based cycles. Besides time, structure is needed in the form of prioritization: which heating consumption-related activities are necessary and which are voluntary? Do I need to do something as a resident or can I ignore?

The monitoring of the consumption of heating being perceived as a duty or a job, investment of time and effort is not self-evident. The monitoring being perceived to require professional skills and knowledge is also found as a barrier. The lack of professional basis introduces an experience of insecurity which is emphasized in problem situations: responsibility is heavier to carry as a private person.

Picture 8. The maintenance man provides a visual signal of everything being alright through physical presence.

Picture 7. Picking up the consumption report has turned into a routine where the printed report introduces a feeling of tangibility. The consumption figures are rarely checked using internet as it lacks the needed tangibility and human connection.

5.4.2 Channels are either personal, physical or digital

Channels experienced as personal out of the tools and physical environments, can either make interaction more meaningful or uncomfortable. Use of personal channels, such as approaching the resident using the apartment as a touchpoint, is more likely to reach the residents and create a feeling of being recognised, whereas the board for example tries to avoid the connection between personal life and matters related to the housing company (picture 6).

The choice of a personal channel can also leave out the targeted person in the context of the community of Kaarikuja 5. The computer and the internet for example represent channels located in the very private and personal side of the resident's life and yet the use of them as a way to reach for example the residents, is not currently workable: accessing housing company-related information requires considerable amount of spontaneity or the needed tools simply are not possessed by the person. Some personal channels, such as face to face or set meetings, are found problematic in terms of social aspects compared to those of functional ones, as they may expose to unease social situations (see more in chapter Interaction = Community).

The use of both digital and physical channels in parallel is not currently ideal. The maintenance man cannot currently collect consumption figures digitally (picture 8), resource-wise found more efficient, though some activities could not be managed only digitally (picture 11). The use of digital interface provided by the maintenance company has not either removed the need for paper handouts (picture 7) serving as tangible reminders found important by actors (see more in Processes emphasize human interaction).

Picture 12. The invitation for the shareholders' meeting is recognized as the invitation is introduced in the context of the resident and the accessing of the invitation does not require spontaneity. Tools for interaction between the residents and the board, the property manager and the maintenance man are currently based on seldom distributed paper handouts.

5.4.3 There are different roles to consider

There are several different roles among the actors in Kaarikuja 5, most of them being hidden and not utilized. The most typical ones, and currently not active or fully utilized ones, are the observer, the messenger, the user and the payer. Many of the roles connect the actors and can be shared or swapped, though currently the roles are mostly fixed. Residents are mainly passive in relation to theirs and the board, the property manager and the maintenance man again struggle in terms of limited resources to cope with those appointed to them.

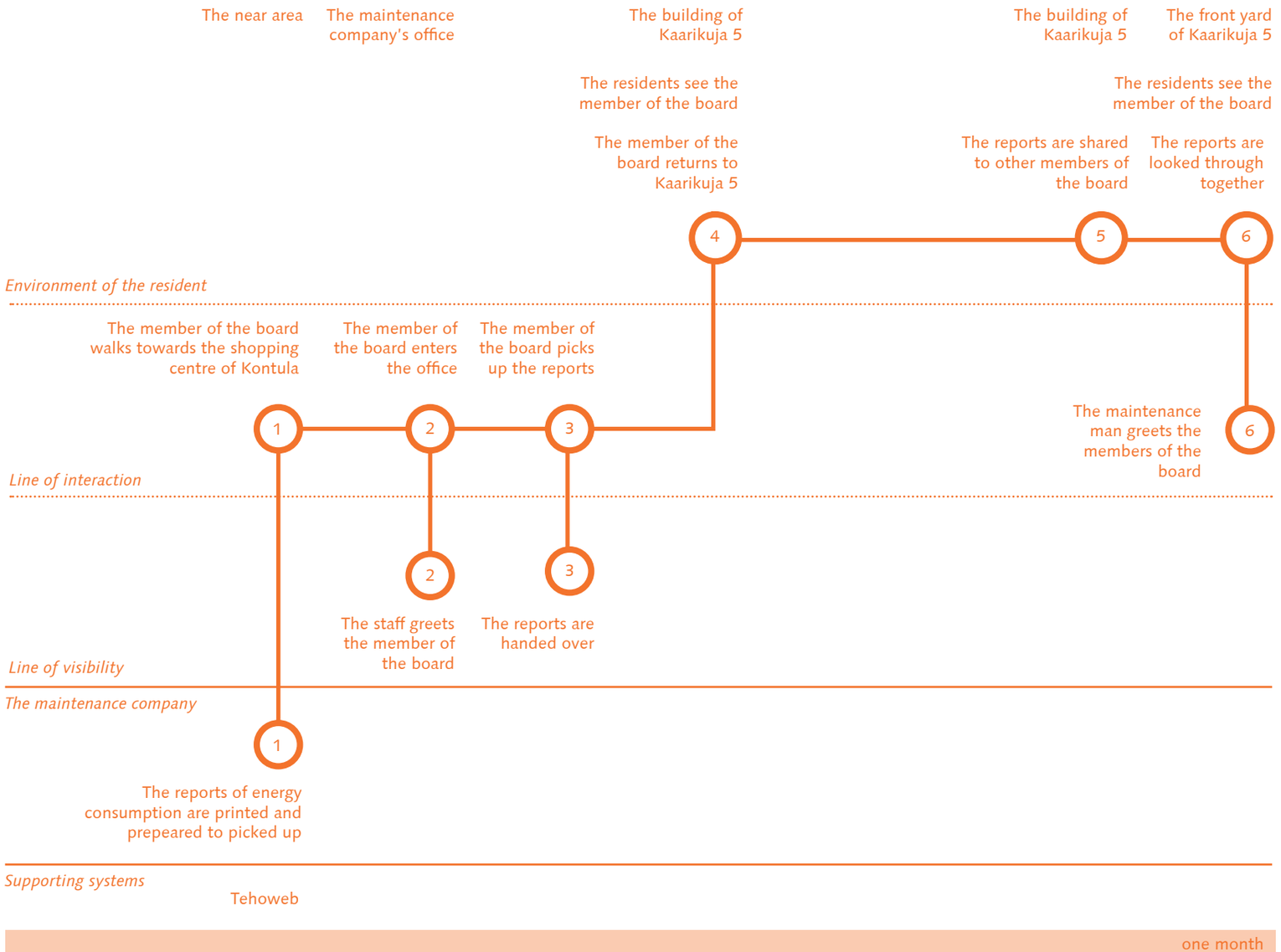
Picture 11. The maintenance man is a neutral party between the other actors, though he often faces situations where he needs to behave as a messenger.

Presence	Time as a measure	Professionalism and duties	To notice and ignore
Bidirectional proactiveness	The cycles of the everyday	Appearing as unaware experienced uncomfortable	Automatic functions
Visual references	Seasons	A work duty turns into personal	Changes in situation
Concrete tangibility	Monthly report	Lack of professional skills as a barrier	Informing equals feedback
Dealing with real people	Daily confirmation		The necessary versus the supplementary
Familiar actors			

Picture 5. Processes and channels within Kaarikuja 5.

Object	Physical environment	Immaterial environment
Meeting face to face	Apartment	Agreed meetings
Mobile phone / telephone	Shared spaces within the building	Occasional meetings
A text message	The yard	Gatherings
e-mail	Technical room for the heating machinery	Shareholder's meeting
Post-box	The maintennce company's office	
The Internet	Near area	
Annoincement board		
Media		

Picture 6. Channels within Kaarikuja 5.



1 The maintenance company prints the energy consumption reports every month for each member of the board of Kaarikuja 5. The maintenance company has adopted the provision of the reports as a regular service moment.

One member of the board walks every month to the office of the maintenance company to pick up the energy consumption report. The office is located less than a five minute walk away from Kaarikuja 5.

2 As the member of the board arrives at the office, the energy consumption reports are already waiting there. The reports are personally handed over by the staff every time. If the property manager is present at the same time, he greets the visitor from Kaarikuja 5 and chats with him or her for a while.

3 The member of the board takes the reports with him or her and walks back to Kaarikuja 5.

4 Residents at the yard see and recognise the member of the board returning from the shopping centre.

Picture 7. The service process of consumption monitoring / The pick up of the report.

5

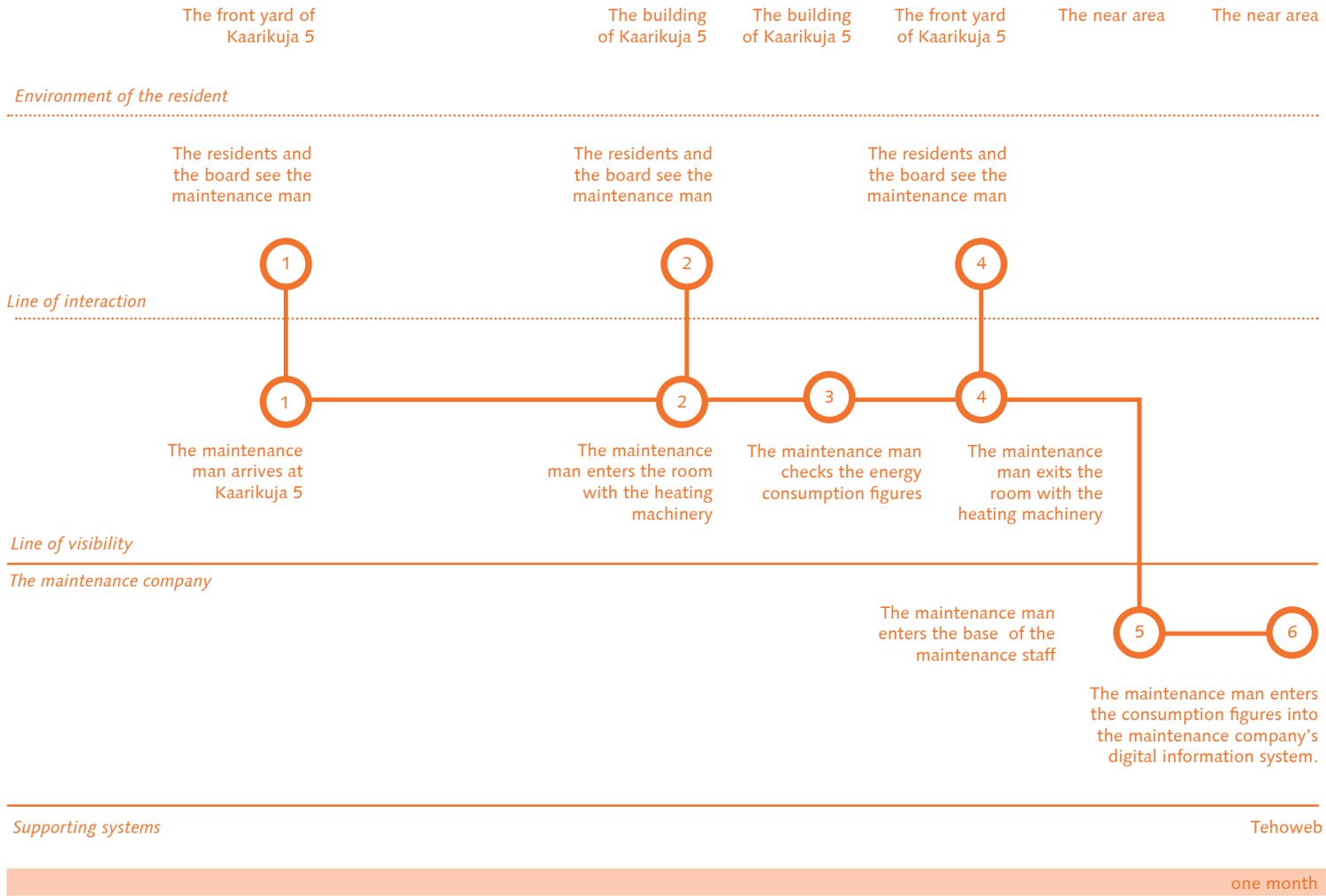
The member of the board distributes personally the consumption reports to the rest of the board. He hands over the report at the yard if he meets him/her on the way into the building or delivers the report through a letterbox

6

The board gathers at the yard to look through the consumption report . Any exceptions are looked for, though usually the maintenance company provides an analysis on possible exceptions with the report either verbally or in written.

Residents at the yard notice and recognise all members of the board.

The maintenance man notices the board at the yard and greets them by waving his hand. He does not though walk to the board which means that he has no fault or anything else needing special attention report to.



Picture 8. The service process of consumption monitoring / the maintenance man records the consumption figures.

1

The maintenance man arrives at Kaarikuja 5. He visits nearly daily to run different kinds of maintenance errands. The recording of heating energy consumption figures and monitoring of them is one of those duties. The recording is carried out every month.

Residents at the yard see and recognise him.

2

The maintenance man enters the building and the room with the heating machinery, where he has his own space for storing tools and paper work. The room with the heating machinery is not visited by others apart from occasional visits made by the members of the board.

3

The maintenance man reads the energy consumption figures from the heating machinery and writes down them by hand into a small notebook he carries around with him for this specific purpose. The maintenance company does not have a system or a technology currently available that would provide the data electronically and automatically. The data provided by SävelPlus is not accessed or used by the maintenance company.

4

Once the consumption figures are recorded, the maintenance man exits the building.

Residents at the yard see and recognise him.

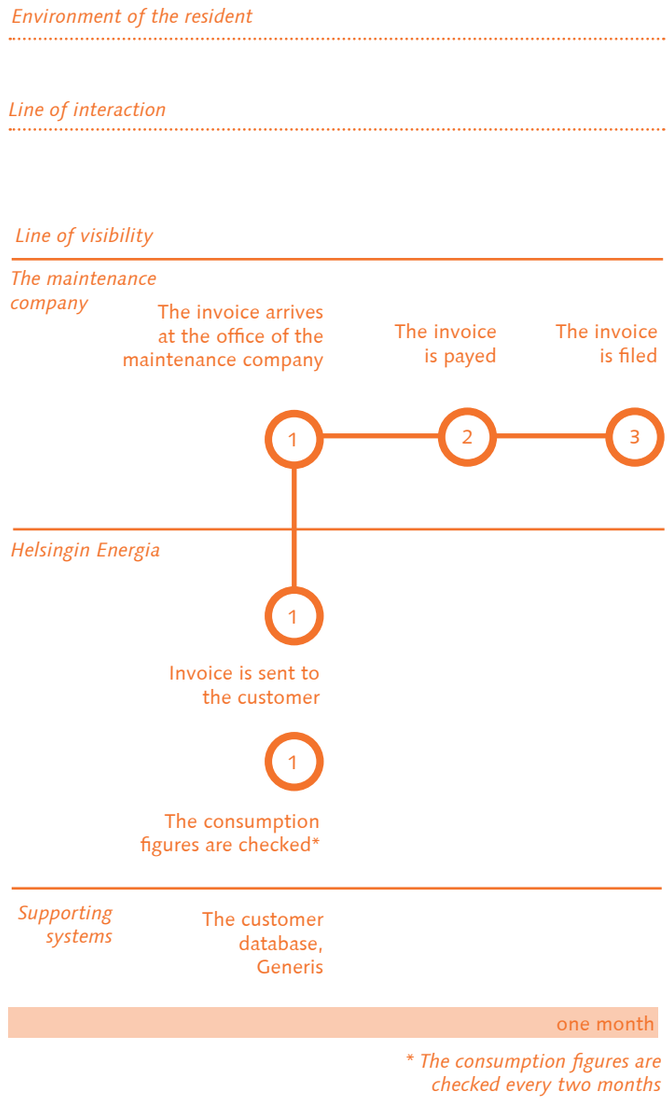
5

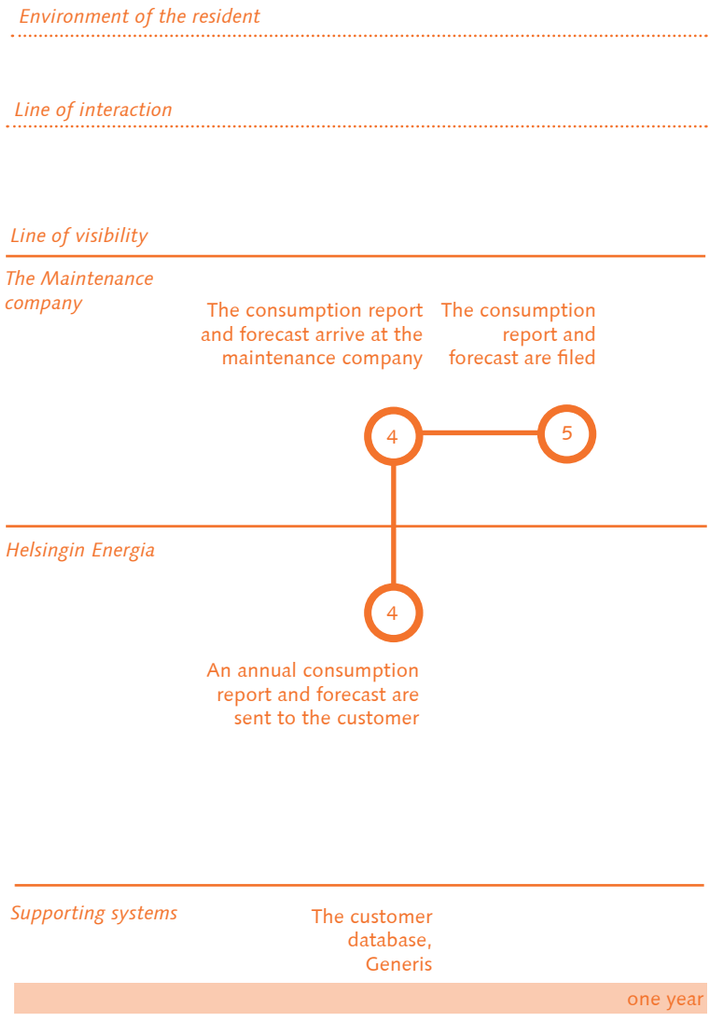
The maintenance man walks to the base of all mainetance staff located in the near area.

6

The maintenance man enters the consumption figures he has written into his notebook with a computer in the base to the online data base of the maintenance company. This takes every time approximately 20 minutes.

Picture 9. The service process of consumption monitoring / the service provider sends the invoice to the customer and checks the energy consumption figures.





Picture 10. The service process of consumption monitoring / the service provider sends the customer a report on the annual heating energy consumption and a forecast report on the forthcoming year.

1

The service provider checks the customer's energy consumption figures every two months. If the consumption data shows a deviation of over 5 %, the reason behind it is analyzed. Contacting the customer or visiting on site is sometimes necessary to find out the cause behind the deviation. Mostly the consumption data shows no deviations and the customer therefore is not contacted. In case of everything being as it should be in terms of the energy consumption, the customer is not informed.

The invoice is sent to the customer every month. The invoice is basing on estimated amount of energy consumption and the estimation is evened out by the actual consumption of the two previous months.

2

The invoice arrives at the office of the maintenance company who manages the payments for the housing company. The invoice is not viewed by the housing company.

3

The invoide is filed at the maintenance company. The invoices are checked by two of the members of the board only once a year at the same time with the audit. Otherwise the invoices are invisible for the customer within Kaarikuja 5. The residents do not have access to the invoices.

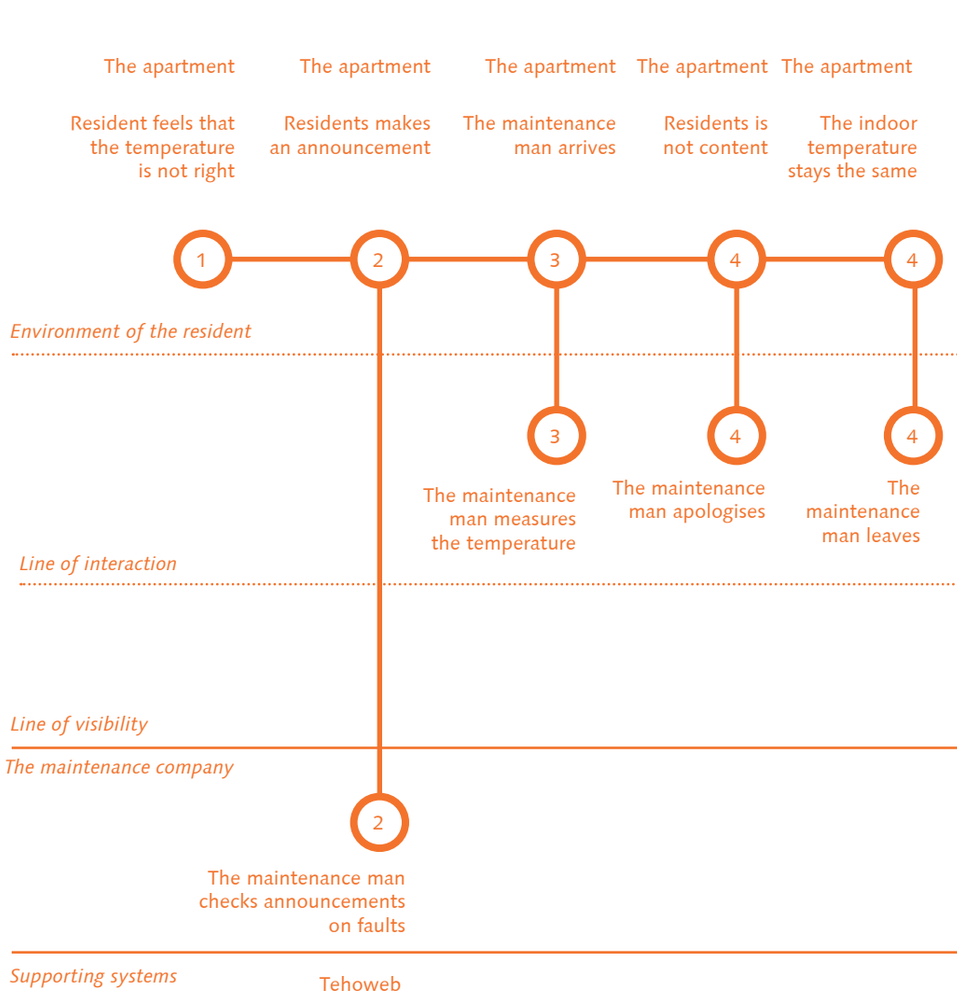
4

The service provider sends the customer every year the annual heating energy consumption report and forecast for the forthcoming year by post.

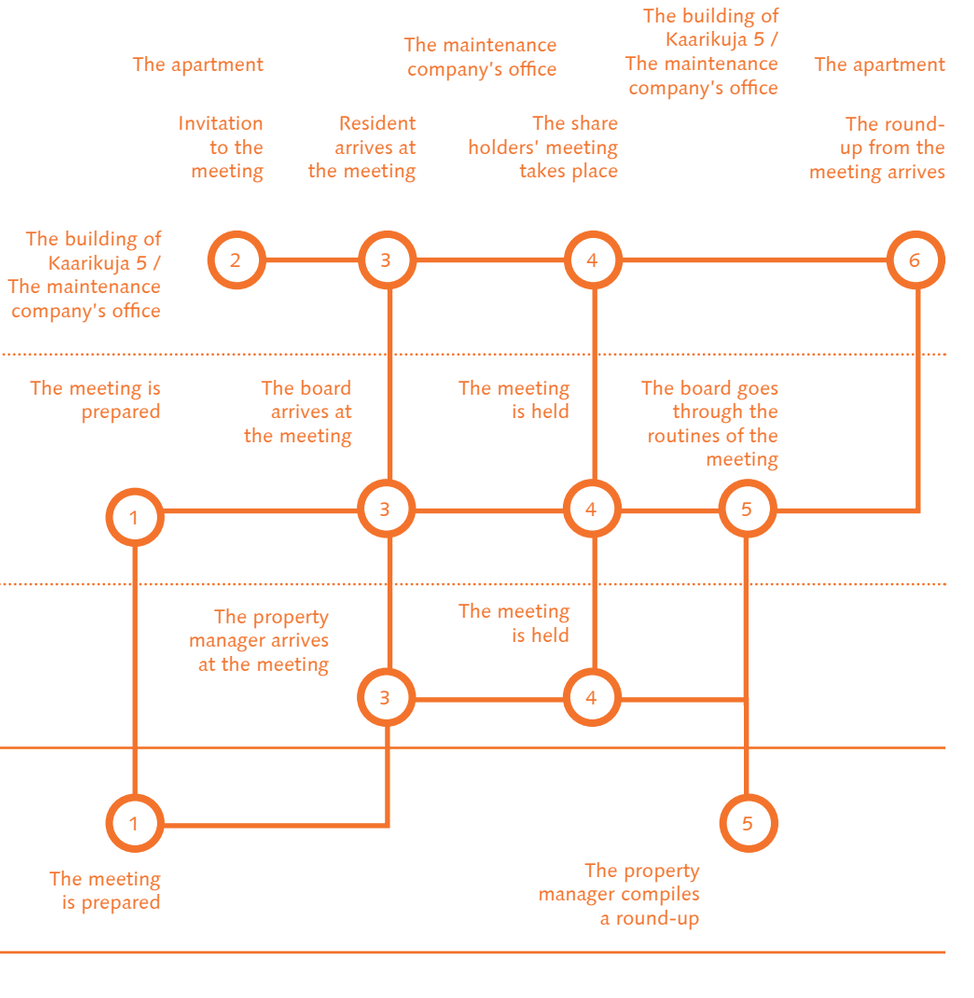
The reports arrive at the office of the maintenance company.

5

The consumption reports are filed at the office of the maintenance company. Besides the property manager, the reports are occasionally viewed by the members of the board. The consumption report provided by the system of the maintenance company is still the primary source of information for monitoring the energy consumption.



Picture 11. The process of consumption monitoring / Resident makes an annoucement on unsuitbale indoor temperature.



Picture 12. The process of consumption monitoring / the share holders' meeting.

1

Resident feels that the indoor temperature in the apartment has been uncomofrtably low for a while. The resident is aware that the maintenance company needs to be announced on the matter.

2

Resdent makes an online announcement on a fault to the maintenance company.

The maintenance man checks the day's maintenance tasks and reads an announcement on too low indoor temperature made by one of the residents.

3

The maintenance man leaves to make a maintenance visit to the resident. He takes with him a precision thermometer to be used to check the temperature at the apartment, since the figure given by the resident might not be accurate.

The temperature is measured at the apartment and the maintenance man has to state that the resident's own thermometer is not showing accurate figures. The apartment has the right indoor temperature and it is corresponding to the set temperature level in the building.

The maintenance man also has to state that the temperature cannot be raised.

4

The resident is not happy, he/she has not been aware on any set temperature levels.

The maintenance man apologises and explains that the temperature level has been set appropriately according to the board and that the resident needs to address the board on the matter.

The maintenance man leaves the apartment.

The resident remains unhappy and insecure about the situation.

(Picture 11)

1

The board and the property manager prepare the meeting. Heating consumption-related matetrs are being delt among other housing company's economic matters.

2

Resident receives an invitation to the meeting through the post-box, one month before the meeting takes place. An energy consumption report is sent with the invitation showing the heating consumption figures.

3

The meeting is held at the maintenance company's office. Only part of the share holder's and residents are present., as usual. Some of teh residents and share holder's cannot make to the meeting due to physical disabilites.

The proeprty manager is also present together with the board.

4

The meeting is held. Heating consumption is not handled separately, unless someone specifically asks a question related to the subject matter. After the official matters there is some time for discussion yet few of the residents wish to ask something or start a conversation.

5

The board goes through the routines of the share holder's meeting.

The proeprty manager makes a record of the meeting. Heating-related matters are included only if they were handled in the meeting and have required a decision to be made. Usually the context where heating is handled is renovation and therefore heating is not delt in every meeting.

6

Resident receives a round-up of the meeting. Also in the round-up, heating-related matters are not often described.

The meeting ends. The property manager has to already run to the next meeting.The residents leave.

(Picture 12)

6 / Recommendations for the next version of SävelPlus

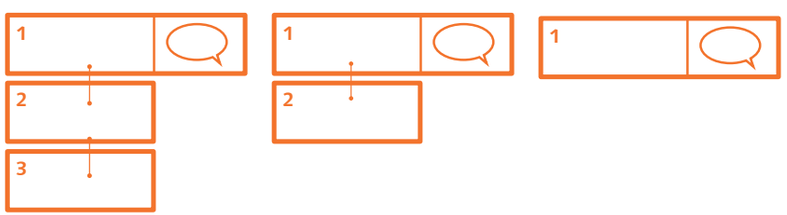
The following recommendations and design guidelines are basing on the results from the design research conducted through the case of Kaarikuja 5 (see chapter 5). They present an alternative to the issues identified in the review on sustainability and service design (see chapter 3) and respond to the commission of Helsingin Energia (see chapter 1). The next version SävelPlus- service aims in the provision of added value by considering different consumers and users, including new areas of content and functions and by positioning itself closer to the client. The service offering of the next SävelPlus consist of three different options, the first being about offering better visibility between the consumers and users or the client[38], and the service provider, the second being about offering better tools and information to control and manage the heating, and the final one being about offering means to forecast and plan ahead for future needs on energy measures. A set of content and functions supporting interaction is also included into the new service offering.

38 Next to the terms consumer and user, the term client refers to the building, the official side of the customer relationship.

6.1 The three directions of next SävelPlus

How the three service offering options are built
Following chapter describes the three service offering options and the ways to support interaction in SävelPlus, the service process and outcome (pictures 14, 16, 17), the content and functions (pictures 15, 18, 19, 21) and benefits for each option. The first option can be implemented separately where as the second and the third are built as continuations for the first one: the second includes the first one, and the third one includes the first and the second one. All social functions and content can be implemented to all service offering options (picture 13).

The different users of the new SävelPlus are built as follows: residents, decision makers, them being the board, the maintenance company and the service provider. Occupants, owners and remote owners belong to the group of residents, the maintenance company includes the property manager and the maintenance man and decision makers consist of



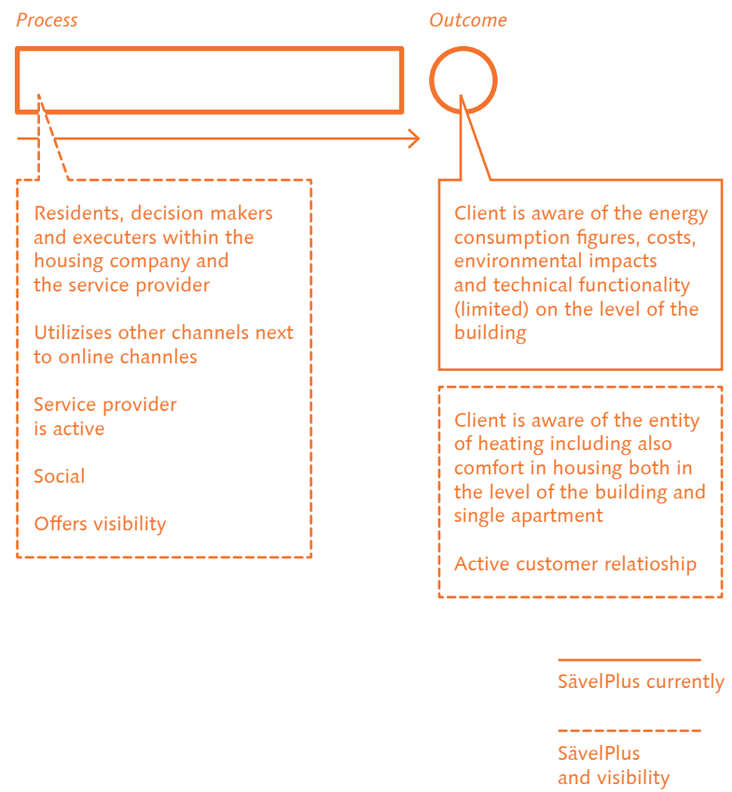
Picture 13. The three development direction entities of SävelPlus.

the board. Helsingin Energia represents the service provider. Functions and content of the service offering options can be targeted to the decision makers if the maintenance company are chosen not to belong to the user groups of SävelPlus. Other refers to all the other residents, housing companies or clients of Helsingin Energia outside Kaarikuja 5.

6.1.1 SävelPlus and visibility

Content and functions of the service offering (picture 15) create better visibility between the actors and the service provider. The service process (picture 14) differs from the one currently in use (see chapter 1) as it acknowledges different users, utilizes several channels and turns the service provider from passive into proactive. The outcome of the service includes new areas of awareness for the client and active customer relationship towards the service provider.

Visibility is information
Comfort in housing is included as a new indicator within heating consumption including the following components: temperatures occurring in the apartments, how the temperature is experienced, level of the temperature of the property and the range of the temperature level. The information on the resident's experience is introduced as new content, and the already existing indicators, costs, consumption figures and environmental impacts, are made visible with additional new information components: the price



Picture 14. SävelPlus and the process and outcome of the first development direction offering better visibility.

of heating, data on distribution[39] of heating consumption and the needed heating capacity of the client. New indicators for the use of the maintenance company are provided in the form of automatic alerts informing about the state of the heating machinery.

Information on heating-related activities is also made visible in addition to the different indicators of the consumption data. Decisions and procedures are made visible between all the actors and recorded through the service, for example: lowering the temperature level and closing down the heating during specific seasons, renovations and adjustments on the heating machinery and all relevant activities conducted by the service provider, currently being hidden (picture 9 for example), yet concerning the client.

Comparison broadens the mind
All heating-related information listed above is displayed as one entity. The user of the service is able to view and compare the data each component at a time or all of them as one whole data. The scale of comparison is extended having the resident being able to use points of references including a single information component, another apartment, the entire property, other housing companies, and the national level of energy consumption. Service provider again is able to compare the data between other clients for further internal service development. The information is visible between all the actors.

39 Distribution refers to the different shares of heat loss generated as heat energy penetrates through walls, the base, windows or the ventilation system. The already existing distribution information is linked directly to the client- focused consumption data.

Observe = prevent
Improved visibility provides a better ability for all the actors of Kaarikuja 5 to detect and identify any faults possibly harming the heating system or resulting in considerably poor energy efficiency. The service provider observes and responses to the new information provided by the client, maintenance company observes the heating machinery, the decision makers observe all the indicators of the consumption data and the resident observes those indicators personally found important.

6.1.2 SävelPlus and possibility for action

Content and functions of the service offering (picture 18) create improved means for the actors and the service provider to act to impact the consumption of the heating energy. The service process (picture 16) differs from the one described in the first service offering option (see previous chapter) by having as an addition both the process and the outcome aiming in getting the client to act.

Knowledge and tools
The service provides residents with knowledge on the use of equipments, both directly and indirectly, impacting the indoor climate and heating consumption. Information on the use of the radiators, ventilation system and habits, measuring the temperature correctly, use of warm water and additional electrical heating devices is included for proper adjustment and use, targeted for the exact heating system in use of the targeted property. Information on how to observe the indoor climate responding to the adjustment and use, and possible impacts on the consumption is also included.

Picture 15. The first development direction for creating visibility between the different actors.

**** In case of the resident being an occupant rather than the owner, the remote owner who is the decision maker, needs to be considered as the side possessing power both in decision making and also in making the information available for the occupant.*

Resident

Information

The entity of heating
Costs
Price
Consumption / MWh
Allocation of consumption
Environmental impacts
Confort in housing
- Indoor temperature
- Experienced temperature
- Set level of temperature
- Range

Procedures
Lowering or increase of heating level initiated by the board
Breaks and temporary or seasonal cut-offs in heating
Decisions

Evaluation
Made by other resident
Made by other housing company

Observation

Monitoring on the level of the apartment ***

Comparison

A single variable in the entity of heating information
Apartment
The houisng company
Other housing company

Decision maker

Information

The entity of heating
Needed capacity
Costs
Price
Consumption / MWh
Allocation of consumption
Environmental impacts
Comfort in housing
- Indoore temperature
- Experienced temperature
- Set level of temperature
- Range

Procedures
Inspections on heating consumption made by the service provider
Inspection on the needed capacity

Evaluation
Made by residents
Made by the service provider

Observation

Monitoring on the level of the building
- recognision
- identification
- interpretation

Comparison

A single variable in the entity of heating information
Apartment
The houisng company
Other housing company

Maintenance company

Information

The circumstance of heating
The property manager:
Needed capacity
Costs
Price
Consumption / MWh
Environmental impacts
The maintenance man:
Technical functionality
Allocation of consumption
Comfort in housing
- Indoore temperature
- Experienced temperature
- Set level of temperature
- Range

Procedures
Inspections on heating consumption made by the service provider
Inspection on the needed capacity

Procedures
Technical inspections and maintenance made by the service provider

Observation

Changes in the circumstance of heating
Deviation or a problem

Comparison

Apartment
The housing company
Other housing companies in the near area as the existing clients of the maintenance company

Helsingin Energia

Information

The circumstance of heating
Needed capacity
Costs
Price
Consumption / MWh
Environmental impacts
The maintenance man:
Technical functionality
Allocation of consumption
Comfort in housing
- Indoore temperature
- Experienced temperature
- Set level of temperature
- Range

Procedures
Renovations impacting the heating consumption
Changes in the heating machinery and in the technical space
Lowering or increase of heating level initiated by the board
Breaks and temporary or seasonal cut-offs in heating
Adjustments
- Balancing the heating system
- resetting the adjustment curve

Evaluation
The housing company

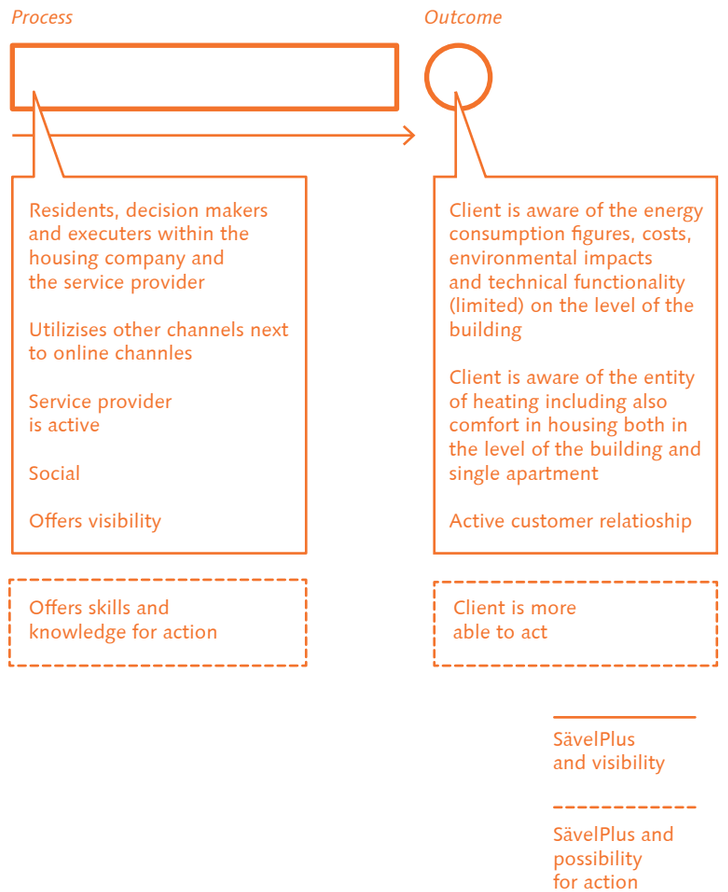
Observation

Changes in the circumstance of heating
Deviation or a problem

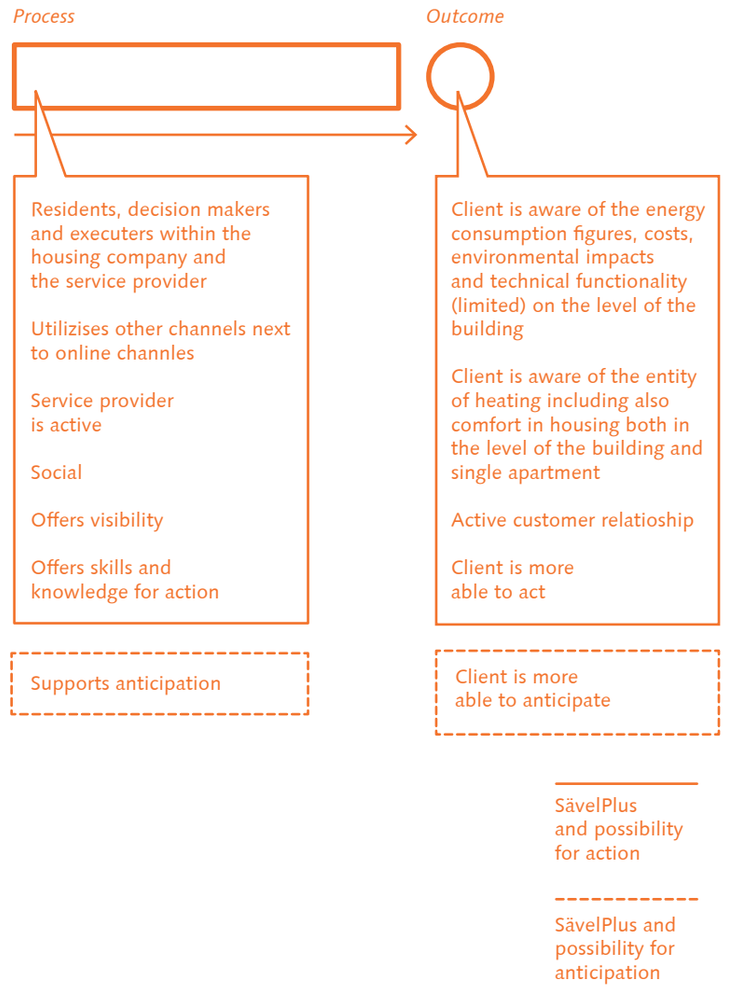
Comparison

A single variable in the entity of heating information
Apartment
The housing company
Other client
Interest group

Already available



Picture 16. SävelPlus and the process and outcome of the second development direction offering better abilities for action.



Picture 17. SävelPlus and the process and outcome of the third development direction offering better abilities for anticipating.

Picture 18. The second development direction for enabling action between the different actors.

** The decision mkaing refers to the possibility of the shareholder to vote in the shareholder's meeting. This addresses only the owners and remot owners.*

*** Only occupants and owners can observe, since it requires constant staying in the apartment.*

Resident

Information

Skills and knowledge on heating-related equipment and touchpoints in the apartment
Radiator
Ventilation
Measurement of temperature
Windows and the balcony
Warm water
Additional equipment

Advised use of heating
Range for adjustment
Efficient use in general

The role of the resident
Tenant
Owner

Action

Control over the equipment
Adjustment of the heating the apartment
Using additional equipment**
Taking part in decision making*

Observation**

The functionality of the equipment in the apartment

The context outside the apartment

Changes in the heating circumstance

Decision maker

Information

Possible options for enhancing the heating in the building

Target level of temperature

Skills and knowledge on heating-related equipment and touchpoints in the apartment
Radiator
Ventilation
Measurement of temperature
Windows and the balcony
Warm water
Additional equipment

Advised use of heating
Range for adjustment
Efficient use in general

Action

Control over the system of the building
Stabilization of the temperature level and adjustment curve
Supporting the apartment level action

Observation

Changes in the heating circumstance

The maintenance company

Information

Skills and knwledge for optimizing the adjustment curve

Correct adjustment of the target level of temperature

Action

Control over the system of the building
Resetting the adjustment curve
Increase and lowering of the temperature level

Balancing the heating system in the building (needs to commissioned from a professional)
Pre-adjustment of the radiator network in the building

Adjustment of the ventilation system

Helsingin Energia

Information

Knowing the heating system of the client
The type of the radiotors
The type of the ventialtion system
Adjustments
- The adjustment curve
- The target level of temperature

Action

Monitoring
The heating system of the client

Provision of advice
Heating system specific

The execution of any optimizing procedures

Connecting client and interest groups

Observation

Changes in the heating circumstance

Possibility for enhancing the functionality of the heating system of the client

Already available

The service offers tools for the decision makers to share and distribute the residents with the knowledge described above in exchange for information concerning the details of the heating system in use in the property. Guidance is provided for example in a format of a handbook for heating, customized to meet the exact heating system features taking place in the property. Decision makers receive also information to support decision making on procedures to stabilize the heating system and indoor climate conditions from a technical point of view. Information such as setting the target level of temperature and cross-check on the existing adjustments set in the heating machinery is provided. The maintenance company, being in charge of implementing the chosen procedures, receives technical information and tools to carry out the needed adjustments and settings. The maintenance company can also make a commission on the procedures through the service provider.

Service provider is able to view and observe the conditions on comfort in housing, unavailable in the first service offering option (see more in the previous chapter). This information combined to the one introduced in the service offering option 2 and together with data on the details of the heating system in use, Helsingin Energia is able to observe and analyze any signs indicating to a need to carry out an adjustment measure.

Act = enhance and tune
The provision of knowledge on how to act, enables the resident to control the consumption of heating in the context of the apartment, enhances the means for the decision makers and the maintenance company to stabilize the heating, and gives the service provider the possibility to offer new service activities and more targeted guidance, and improves the utilization of interest groups. Residents can use their equipment appropriately, decision makers can choose the correct procedures, the maintenance company has better skills for implementing the procedures and the service provider actively consults the client or passes on the customer need for appropriate interest group.

6.1.3 SävelPlus and future planning

Content and functions (picture 19) for heating-related future planning include information on possible heating-related problems and possibilities, recognition of those problems and options to act in advance. The service process (picture 17) supports anticipating and produces an outcome of the service users with better ability to anticipate as an addition to the process of SävelPlus and possibility for action.

Information on problems and possibilities
The service provides the client with information on long-term problems potentially emerging from unstable indoor climate conditions impacting comfort in housing, problems related to increased heating costs, environmental impacts and technical problems. The information is matched with information on potential long-term solutions aiming at energy renovations. Information on renovation possibilities provides examples and estimations on potential energy savings, impacts to the indoor climate and environment and costs. The client, here Kaarikuja 5, makes the already known long-term problems visible and the service provider receives information on renovation plans and needs.

Resident

Information

Problems related to the circumstance of heating in the apartment including all aspects, also comfort in housing, that cannot be addressed at present

Energy renovations
Options
Potential savings in energy consumption
Impact to the circumstance of heating
Costs

Observation

Problem relating to comfort in housing or other aspect within the circumstance of heating

Action

Impacting decision making*

Decision maker

Information

Problems related to the circumstance of heating in the building including all aspects, also comfort in housing, that cannot be addressed at present

Energy renovations
Technical options
Potential savings in energy consumption
Impact to the circumstance of heating
Costs

Observation

Problem relating to comfort in housing or other aspect within the circumstance of heating

Action

Planning including for example budgeting

The maintenance company

Observation

The heating system
- Age of the heating machinery
- The condition of the building in heating related matters such as insulation

Possibility for joint renovation with other housing companies

Action

Informing

Helsingin Energia

Information

Planned heating-related renovations
Potential needs for energy renovation

Observation

Changes in the circumstance of heating
Possibilities for enhancing the heating system in the long term

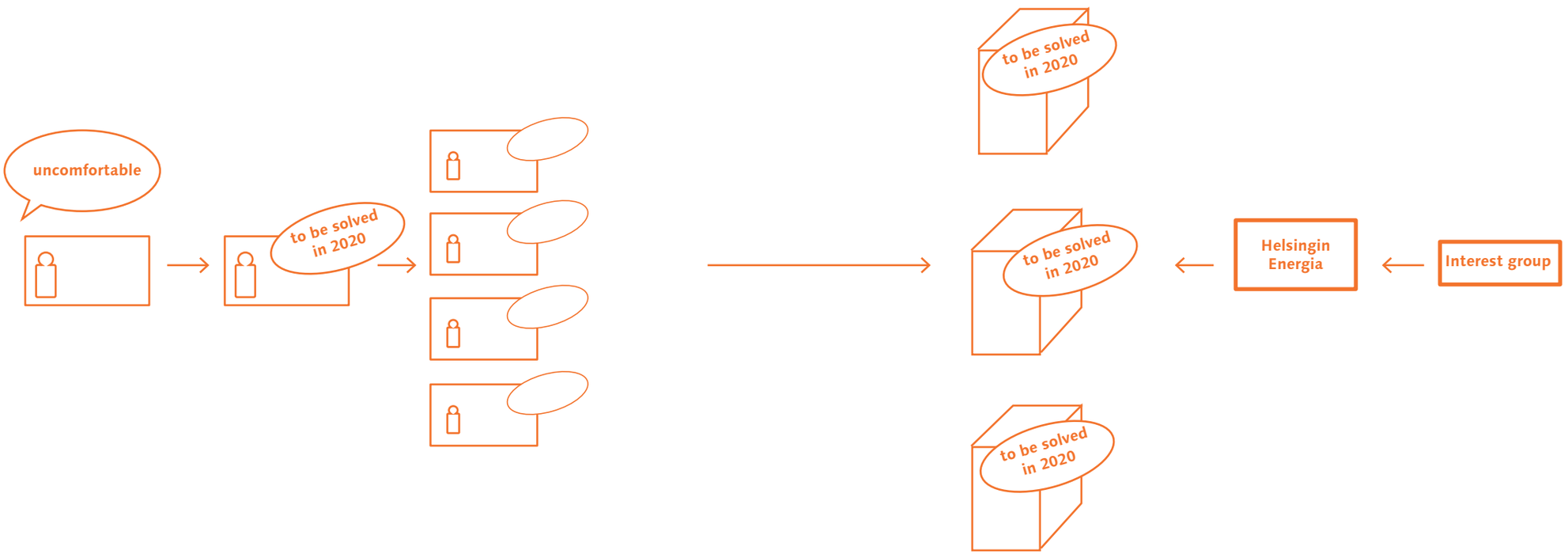
Possibility for joint renovation with other housing companies

Action

Advice and guidance
- Energy inspection
- Operations model
- Connecting clients and interest groups

Picture 19. The third development direction for enabling anticipating between the different actors.

** The decision mkaing refers to the possibility of the shareholder to vote in the shareholder's meeting. This addresses only the owners and remot owners.*



Picture 20. Forecasting connects residents, housing companies, Helsingin Energia and different interest groups.

Anticipating through observations
Information on how to make observations possibly indicating to a long-term heating-related problem is provided and possibility to record the findings is offered. Information supports to recognise problems related to comfort in housing or economic-technical phenomena such as considerably low indoor temperature or ageing of the heating machinery. Resident, the decision makers or the maintenance man record an observation into the service and the observations are made visible also between other housing companies. The service provider compares the data gathered through the observations, identifies the needed long-term energy efficiency measures to improve the client's heating system and brings together the interests of the client possibly together with several other housing companies and those of potential interest groups.

Action before real action
Service provider offers guidance and advice for how to prepare for possible future energy renovations and the decision makers can start planning. The guidance contains an energy inspection[40] and possibly even an operations model for how to carry out energy measures in cooperation with other housing companies and interest groups.

Supporting each other
SävelPlus and future planning enables offering of new services, more targeted provision of advice and better utilization of interest groups (picture 20). Residents have a better possibility to influence on energy-related decisions, decision makers get support for planning of large-scale energy renovations and the maintenance company can improve their service activities. The cooperation between several housing companies helps to gain better contracts within energy renovations. The increased interaction also contributes directly to the Suburb 2072-joint venture goal on user-centred long-term development of the suburbs by opening new energy-related collaboration opportunities between several actors.

40 The energy inspection refers to a service called "energiakatselmus" in Finnish.

6.1.4 SävelPlus and interaction

Content and functions (picture 21) supporting interaction between the actor groups include ways to communicate, control social interaction and produce new information. The functions within SävelPlus and Interaction make the relationship between the service provider and the client from passive to active.

Personal opinions turned into information
Personal opinions of the actors on heating-related decisions and procedures are turned into measurable data equally important than that of costs or amount of energy consumed. Residents and the decision makers can view opinions and utilize them in decision making or in voting, the service provider can collect and view opinions, compare them to those of other clients and compose information entities for example to indicate customer satisfaction of city dwellers for either internal or external communication purposes.

Resident

Information

Personal opinion

Action

Questions and answers
Discussion

Creating interaction
Board
Other housing company
Resident

Control

Privacy
Time & place

Decision maker

Information

Supplementary information
for decision making

Action

Questions and answers
Discussion

Creating interaction
Other housing company
Resident
Helsingin Energia

Control
Making an initiative
Privacy
Time & place
Identifying the person
making the contact

Coordinating the inetraction
- Anticipating
- Resourcing

The maintenance company

Action

Questions and answers

Creating interaction
Helsingin Energia

Control
The maintenance man:
Maintaining neutrality
between the board and the
residents

The property manager:
Time management

Helsingin Energia

Information

Clients and citicenzs view
on distric heat

Action

Questions and answers

Creating interaction
Board
The maintenance company

Control
Making an initiative

Picture 21. SävelPlus enables improved social interaction between the different actors.

Create interaction and to control it
SävelPlus enables actor groups to discuss, ask and answer questions, comment and control communication on heating-related matters between each other. Controlling the communication in terms of the decision makers emerges as functions that protect privacy, help recognize the residents, control the time and place for interaction and help resource and anticipate contacts made by the residents between the members of the board. Communication from the decision makers' side is aimed at the service provider, residents and other housing companies.

Controlling the communication among the residents translates into protection of privacy and control of the time and place. The sides for communication are the decision makers, other resident and other housing company.

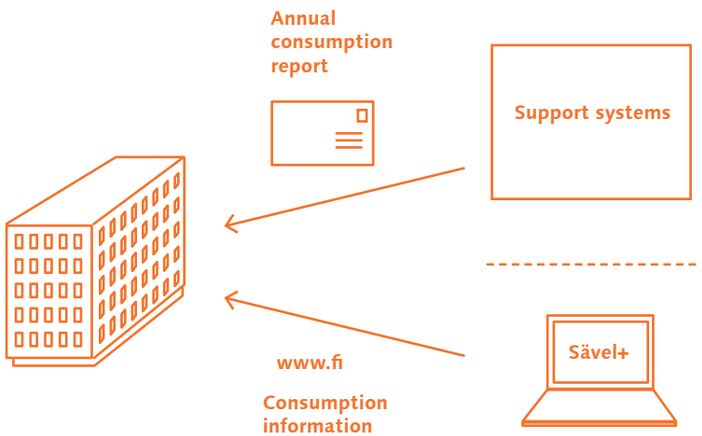
The side for communication for the maintenance company is the service provider. Control for the maintenance man is about maintaining the neutral role between the residents and the decision makers, whereas the property manager can use functions aiming at time management between the resident and the decision makers in heating-related matters. Service provider can communicate with the client, the decision makers and the maintenance company, and controlling turns into the possibility to be the proactive side of the interaction.

Feeling protected and safe
Means to structure and control interaction create "filters" between the actor that prevent negative social phenomena impacting the communication. Increased feeling of safety helps to activate passive residents and support the decision makers to embrace the increased activity.

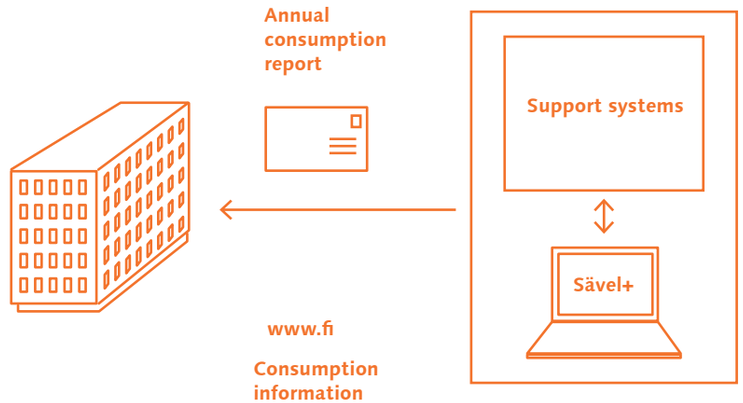
6.2 Service design guidelines - How to build next SävelPlus

Implementing service recommendations
The following recommendations describe general guidelines for implementing the three development directions, guidelines for enabling good service experience through interaction and guidelines basing on the insights of the key areas around touchpoints: processes and procedures, channels. The guidelines can be implemented to all three development directions and they can be utilized for designing any functional or visual elements impacting the service experience.

SävelPlus = Centrepiece for district heating services
The current service for energy consumption monitoring obtains the content using several different support systems (picture 22) resulting in inconsistent service experience. SävelPlus seems unconnected to the basic services of district heating. All information and service activities related to consumption of heating in the new SävelPlus (picture 23) are therefore unified in a way that all service activities are can be perceived to come from one place no matter what are the channels used



Picture 22. SävelPlus and other energy consumption-related service activities are currently apart from each other.



Pictue 23. In the next version of SävelPlus, other energy consumption-related service activities are unified together with SävelPlus in a way that consumption monitoring appears as a service entity to the client.

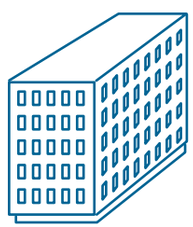
them being digital or physical (compare to Internet banking). SävelPlus thus functions as a digital home for all energy consumption and customer information management- related matters. The first step is to unify SävelPlus with the annual consumption and forecast reports by harmonizing the visuals and the operating principles.

Portal between the client and the service provider
The recommendations aim in increasing interaction between the client and the service provider Helsingin Energia turning SävelPlus into a communication tool and a channel for passing information. These new ways of using the platform provides the possibility of SävelPlus being used as a tool by the personnel of Helsingin Energia. The service operating as a portal can be managed by creating limits for visibility between the client and the service provider.

Different language to different users
All content and functions need to be communicated in a way appropriate for each actor group. The context of an apartment is used when addressed the resident whereas the board, the property manager and the maintenance man need to be provided with information using the property as the primary scale. The vocabulary besides the content and the scale need to be considered: easily understandable visualizations are to be used for the residents and technical details for them who find it natural.

The advantages of presenting oneself anonymous can be utilized to ease and support social actions described in the recommendations. Residents can for example be seen as anonymous to each other to lower the barrier to engage into the interaction, and the board can be for example displayed as one uniform party to prevent the interaction related to housing company matters to turn into a personal issue between actors.

Guidelines for using processes, channels and roles
The ideal way to create processes and procedures, appropriate use of channels and the utilization of the different roles played by the actors are described through a set of guidelines found in the pictures 24-26.



1 Provide an experience of presence

Be proactive as a service provider and motivate the client to contact more actively: communicate regularly also when there is nothing for the client to notice and that everything is as it should be

Create an experience that you as a service provider will be present in case of an emergency fault or a smaller fault: communicate how you as a service provider will act and be present in case of a fault, including what procedures such as arriving to the location are being conducted, and how the service provider can be reached in such occasions

Use visual references, such as tangible objects or different channels for creating a sense of presence.

Make all service activities human by creating an experience that the interaction is always from a person to person rather than from person to a system

Build a personal relationship between the client and the personnel by referring to actual names of the people

2 Use time as the primary indicator

Use existing everyday cycles such as a cycle of one moth or three months for managing communication and information content

Use seasons both as a way to organize and visualize information content together with ways to browse information with the following options: history, present and future

Provide the opportunity for the users of the service to define the desired time frame and rhythm to manage functions and content, but provide a default time frame such as one month to start with

3 Separate the professional and the unprofessional

Provide different kind of content and functions for a professional user and the unprofessiona user

Make the user of the service visible either as a professional or as a unprofessional for the user him-/herself and for all other users

Motivate the users to ask present questions and comments and communicate that unawareness is not a negative thing

4 Create "traffic lights"

Always communicate how the receiver need to react to any information provided through interaction: make a clear difference between necessary actions and information, and voluntary or additional actions and information, also communicate if no actions are required

Use hierarchy between necessary and voluntary: first make visible the content requiring attention

Cmmunicate the consequences of both the necessary and voluntary actions and information: potential accessible benefit or a potential loss of a benefit

Separate activities taking place automatically and tho ones needing activation from the user's side

Picture 24. Guidelines for processes and procedures.

5 Be personal

Utilize channels and environments perceived as personal in interaction towards the resident, mainly translating into the utilization of the apartment, the phone or the mobile phone and e-mail

Use phone or mobile phone only in case of important and urgent communication

6 Do not be personal

Utilize personal channels such as the phone or the mobile phone only in case of important and urgetn matters

Utilize channels perceived as appropriate for work-related communication having distance if needed to private life, such as e-mail

7 Use active channles to support passive ones

Utilize channels not requiring spontaneity to inform the users of the service about the existence of other channels

Approach the resident through the apartment or using the annoucement board in the ahll of the building to guide them to the Internet

8 Continue from the digital to the physical

Make the Internet the complete and primary location for all service content and activities and in parallel provide parts of the content and activities in the physical environment as well: make touchpoints suitable to be placed in the physical environment of the building and provide content in a format possible to be printed.

Provide tools and content in a print or otherwise in a physical format available for example through order

Picture 25. Guidelines for channels.

9 Make all roles visible

Make roles of all actors visible, especially those of the board, the property manager and the maintenance man

Utilize the roles as the basis for functions and activities in the service: for example a resident can observe, operate as a messenger, look for information and represent other resident

10 Enable flexibility

Enable the functions and activities to be swapped or shared between the users of the service accodring to the needs of the client

11 Consider users with multiple roles

Functions and activities need to be designed to able users with multiple role to use the service with ease: a member of the board can browse consumption information as a resident and a decision maker

12 Utilize hidden roles

Include roles as functions and activities currently not used: the messenger and the representative

Activat roles currently passive roles, especially in relation with the occupant, the owner and the remote owner by making them visile in the service: the role of the payer, the role to influence and the user of the heating

Picture 26. Guidelines for roles.


11336 – 11410
11411 – 11480
11631 - 11700
11701 - 11785
11956 - 12035
12036 - 12115
12271 - 12350
12591-12685
12686 - 12770

7 / Discussion - How to build value on energy consumption monitoring

The following chapter summarizes the results followed by research questions 2 and 3, and describes briefly the conducted design research method and realization (see chapter 2). The gathered insights from the review on sustainability and service design (see chapter 3) and results from the design research case (see chapter 4) are described answering to the research question 2 and 3. Further, the research question 1 (see chapter 2) is answered by reflecting the recommendations to the results gained through the research questions 2 and 3, and conclusions on the contribution and realization of the thesis are made with future recommendations.

7.1 Round-up - Results

The research question 2, what issues are related to the means and strategies currently used to speak to energy end users?, was explored by looking into literature and current studies on sustainability and service design to review the current strategies and means used to speak to energy end-users in the context of smart metering and other related energy services. Possible issues, problems and challenges were explored.

The energy efficiency regulation initiated strategies and means explored are basing on technological implementations and the use of approaches emerging from social and behavioural sciences. The technological implementations under review were smart metering devices and other energy services including in-home displays and online and mobile applications. The smart-metering devices provide the customer and the user with cost-efficiency driven information and the strategies from social and behavioural sciences include different intervention strategies such as the use of social norms for example in the form of competition, comparison and motivation. The provision of information on monetary, environmental and consumption-based premises and the use of social norms were found partially ineffective or questionable. Only short-term effects are gained and the use of social norms can introduce unconscious behavioural change or protest from the consumers and users. A need for other options was noted.

These issues found were reflected to the approach and means used in service design to speak to consumers and users. The premises such as desirability, wants and active customer relationship used in service design together with customer and user-centric methods in building value adding services, were found conflicting compared to the approach used within smart-metering and energy services. The need for service design approach was noted.

The research question 3, what needs there are to be considered when including the resident into a value adding energy consumption monitoring service?, was explored by

conducting participative action design research. The research was carried out by using a case of housing company Kaarikuja 5 located in Kontula, Helsinki that represents the target customer and the user. The research activities were conducted by using contextual inquiry together with prototyping. Qualitative information on the customer's and user's needs, drivers and hurdles, related to energy consumption monitoring within district heat were gathered and analyzed by also considering the service provider's point of view.

The main areas of needs recognised were lack of visibility between the actors in the target location, insufficient means and tools to act towards the energy consumption monitoring and manage social interactions within the community of the target location. The definition of the practical perception on consumption information, the different actor groups and the monitoring activities were also identified.

The drivers and hurdles related to the lack of social interactions were the board being overloaded in managing the interactions in the community, missing discussion and need for safety. The drivers and hurdles related to the insufficient means and tools to act were the apartment as the main interface for controlling heating not being usable or understandable, the need for control not being met and the ability to forecast being poor. The drivers and hurdles related to the lack of visibility were information on the physical experience over heating not being accessible, apartment operating as the line of visibility and missing technical and customer-related information. The practical perception on consumption information showed subject matters to be missing such as comfort in housing, advanced technical data and functionalities, points of references easy to relate to and

customer information. The service elements and phenomena again showed need for introducing processes and procedures perceived as human, personal, digital and physical channels and the recognition of different roles.

7.2 Building added value on energy consumption monitoring

Building added value on energy consumption monitoring
The main research question, how to build value on energy consumption monitoring service?, is answered by comparing the recommendations to the customer and user needs recognised through the case of Kaarikuja 5 represented in the research results (see chapter 5) and the sustainability and service design- related issues (see chapter 3). The main focus is in a service design approach and how the added value in smart-metering and other energy services can be built through a service experience. The benefits contributing to value adding service experience are basing on the notions of convenience, wants, desirability, active customer relationship and the actual elements forming the service moments and touchpoints.

The functionalities and content supporting active customer relationship and especially the ability for the service provider to respond to changing customer needs are the following: improved information on the client, connecting other customer information from Helsingin Energia's supporting systems to SävelPlus, viewing any heating consumption measures or plans made by the client, viewing possible changes in the indoor climate or technical functionality. This enables the service provider to detect and identify changing customer needs.

The re-positioning of Helsingin Energia closer to the client and operating as a link towards interest groups supports more active customer relationship (pictures 29-30) and enables Helsingin Energia to adapt to changing needs even beyond the district heat service offering. Communication between the client and Helsingin Energia enables sustaining of active customer relationship and potentially the observing of changing customer and end-user attitudes and customer satisfaction.

The introduction of variables and subject matters beyond plain cost-efficiency provides the customer and the user with better selection of incentives and possibly deteriorates the unconscious influence on the user through the following features: measurable information on comfort in housing is available and more versatile selection of variables to compare with is accessible (picture 28), the provision of knowledge and tools on how the customer and user can act themselves prevents unconscious behavioural change and possible protest behaviour, turning personal opinions to information on energy consumption monitoring introduces new content and variables outside monetary, consumption-based and environmental premises. Also the introduction of social connections, the connections between other housing companies and residents again bring a new content variable beyond cost-efficiency.

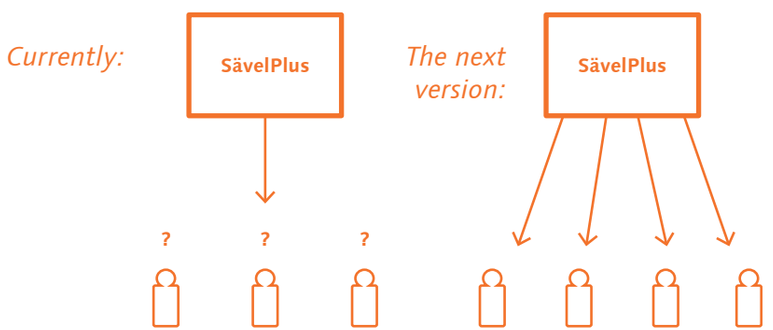
The provision of new tools and content gives an opportunity for Helsingin Energia to produce new service touchpoints that can be harnessed to offer convenience and desirability, and serve the wants of the customer and the client. New guide books on how to use heating at the apartment or provision of technical advice can be for example designed to speak to the customer and user beyond utility and practical functionality.

The consumer and the end-user of energy can be approached in a better way as the different user groups are considered. More targeted information and incentives are provided compared to the provision of plain, general monetary, energy consumption- based and environmental information (picture 27).

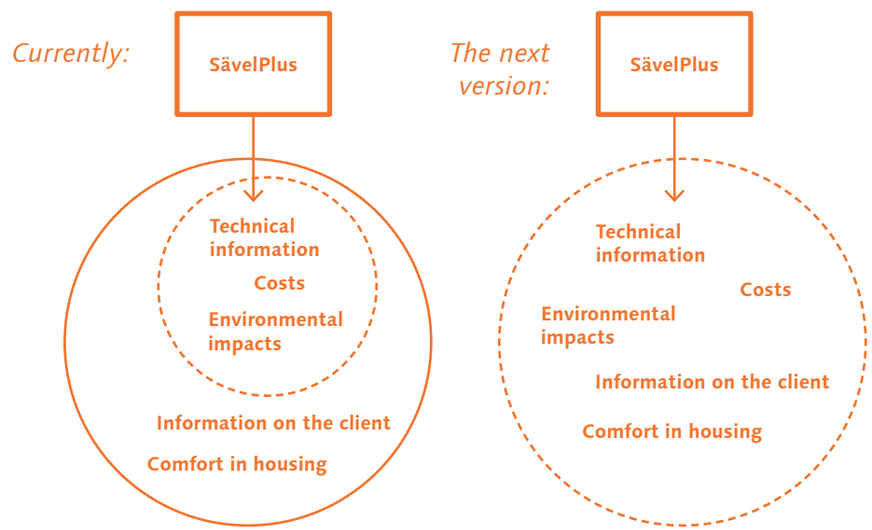
Many of the service activities and content introduce better participation of the client, customer and the user into the actual production and consumption of the service, making the service experience richer.

Finally the design guidelines built to enable the implementation of all the functionalities and content described above contribute to the creation of value adding service experiences. Human-driven processes and procedures, the implementation of both physical and digital channels and the acknowledgement of different roles are all designed to take place through service moments relevant to the consumer and user needs and therefore convenience, desirability and active customer relationship can be realized in practice.

The functionalities, content and approaches described within the recommendations contribute to added value service experience by introducing premises for content and variables beyond cost-efficiency, relying on activities possibly influencing to the customer and end-user of energy consciously and not defusing protest behaviour. The service directions aim in active customer relationship that is sustained and adjusted according to the changing needs of the client, customer and end-user.

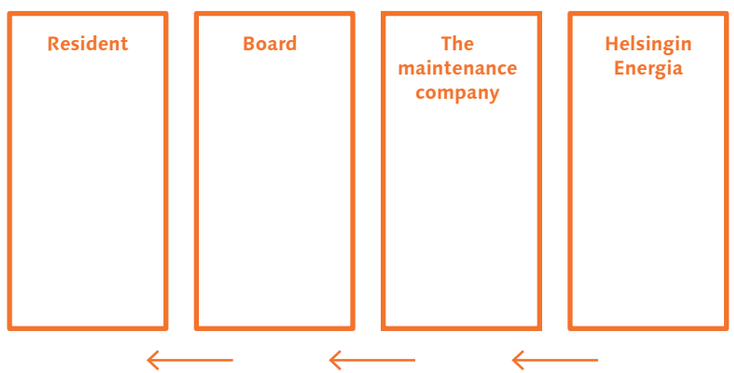


Picture 27. The next version of SävePlus acknowledges different users.



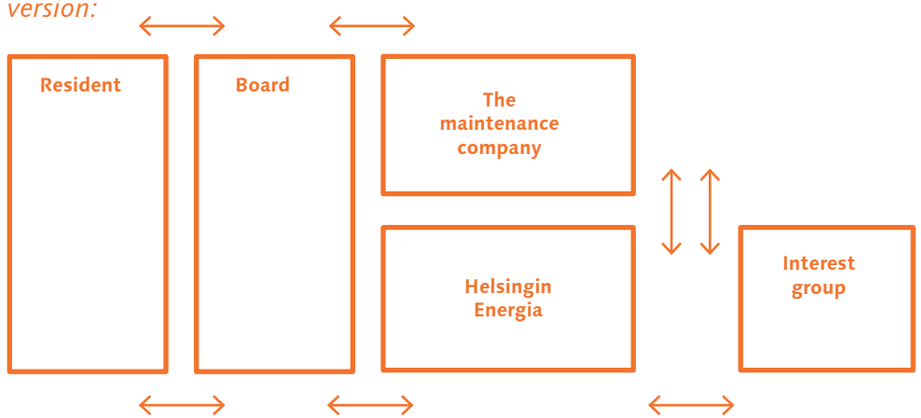
Picture 28. The next version of SävelPlus includes heating as a meaningful entity.

Currently:



Picture 29. Currently Helsingin Energia is not having as active customer relationship wo the client compared to the maintenance company.

The next version:



Picture 30. The next version of SävelPlus positions Helsingin Energia closer to the client, next to the maintenance company.

These recommendations and design guidelines provide an alternative for the means and strategies currently used within smart-metering and other energy services through a case example on energy consumption monitoring service SävelPlus within district heat services.

7.3 Reflection and future recommendations

Objectives of the thesis were met by introducing recommendations according to the commission for the use of district heat service and product development within Helsingin Energia (see chapter 1). Service directions and design guidelines were created and a concrete starting point for the next version of energy consumption monitoring service SävelPlus was provided. The goals of the Suburb 2072- joint venture again were met through increased interaction between the energy provider and the suburbs and by introducing means and strategies to bring together different actors and companies within the target area to support the future energy renovation measures in the present.

In terms of challenges and limitations of the thesis couple of aspects need to brought up. The one main challenge in answering to the primary research question was in the functionality of comparison. Strong connections to the means and strategies on normative messaging and on the other hand, an important role in the introduction of intelligibility and relatedness within the provision of information for customers and users within Kaarikuja 5, appeared problematic. Though comparison was mentioned as one of the questionable characteristics within the review on sustainability and service design, some level of comparison is needed. The possible threats on introducing unconscious influence and protest behaviour can be possibly solved though through different design decisions. The challenges within comparison would be appropriate to address while applying it to energy services by making sure the principal purpose.

The use of a case and the PADR method again introduced an opportunity to go deep and use a smaller instance to reveal opportunities, potentially utilized later on a bigger scale (Liedtka et al., 2009), and provided a vast range of different point of views. On the other hand from the point of view of the commission, the use of one case introduces limitations in the implementation of the recommendations as the results of the thesis cannot be generalized. Prototyping and testing with other customer and user target groups in the phase of concepting is thus needed. The results of the thesis functioning as the starting point, possible alterations and adjustments might be needed.

The development of the energy consumption monitoring service SävelPlus currently continues within Helsingin Energia and the results and recommendations of the thesis are introduced within the team working with both ongoing and near future developments. By the time of completing the thesis, I, the writer of this thesis became part of the team working with SävelPlus and now have the possibility to influence the introduction of the results of this thesis and technology and energy services in general into Finnish homes.

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Appendix

Annan luvan kommenttien ja kuvien käyttöön seuraavanlaisesti:

Ymmärrän, että havainnointitilanteesta tehdään muistiinpanoja ja otetaan valokuvia sekä haastattelu nauhoitetaan, ja että materiaali saattaa sisältää henkilökohtaisia tietojani. Helsingin Energia ja Aalto Yliopiston lopputyöntekijä Taru Hynynen voi muokata minusta otettuja valokuvia tarpeelliseksi katsomallaan tavalla. Luovun oikeuksistani tarkastaa tai kommentoida aineistoa ennen sen käyttöä.

Ymmärrän, että henkilötietoni pidetään luottamuksellisina, ellen anna kirjallista suostumusta muuhun.

Hyväksyn seuraavat materiaalin käsittelytavat:

☐ Minuun saa ottaa yhteyttä, jos Helsingin Energia haluaa kysyä lupaa kuvani ja/tai kommenttieni mahdollisesta julkaisemisesta.

☐ Annan kuvani ja kommenttini Taru Hynysen käyttöön ja Helsingin Energian sisäiseen käyttöön, mihin sisältyy myös lopputyön julkaisu Aalto- yliopiston toimesta.

☐ Henkilöllisyyteni ei saa paljastua kuvasta, jota käytetään ulkoiseen ja sisäiseen tiedottamiseen.

päiväys nimi allekirjoitus

Appendix 1:
Consent form sheet to be used in Kaarikuja 5

Haastattelu- ja havainnointilupa

Kiitos, että annat luvan haastattelun dokumentointiin. Otan muistiinpanojen lisäksi valokuvia sekä nauhoitan haastattelun.

Haluan valokuvata ja nauhoittaa tilaisuuden seuraavista syistä:
Voin käyttää vähemmän aikaa muistiinpanojen tekemiseen ja enemmän aikaa itse haastattelemiseen. Materiaalin jakaminen tiimin jäsenten kesken on myös helpompaa.

Käytän dokumentoitua materiaalia työprosessin projektin tulosten sisäiseen ja ulkoiseen tiedottamiseen, sekä Helsingin Energian/HelenLämmön ja Aalto Yliopiston/ lopputyötyöskentelyn vaatimaan sisäiseen käyttöön.

Lue alla olevat lausekkeet ja allekirjoita tämä lupalomake. Kiitos.
Osallistun tähän haastatteluun vapaaehtoisesti. Ymmärrän, että haastattelusta tehdään muistiinpanoja ja otetaan valokuvia sekä haastattelu nauhoitetaan, ja että materiaali saattaa sisältää henkilökohtaisia tietojani. Helsingin Energia/HelenLämpö ja Aalto Yliopiston lopputyöntekijä Taru Hynynen voi myös muokata minusta otettuja valokuvia tarpeelliseksi katsomallaan tavalla.

Luovun oikeuksistani tarkastaa tai kommentoida aineistoa ennen sen käyttöä. Myönnän Helsingin Energialle/HelenLämmölle ja Aalto Yliopiston looputyöntekijälle Taru Hynyselle nimenomaisen ja yksiselitteisen luvan käyttää aineistoa tai sen avulla yllä mainituista syistä tuotettuja aineistoja. Ymmärrän, että Helsingin Energia/ HelenLämpö ja Aalto Yliopiston lopputyöntekijä Taru Hynynen pitää henkilötietoni luottamuksellisina, ellen anna kirjallista suostumusta muuhun.

Lisäksi hyväksyn seuraavat haastattelussa kertyvän materiaalin käsittelytavat:

☐ Kasvoni saavat näkyä kuvissa, joita käytetään ulkoiseen ja sisäiseen tiedottamiseen.

☐ Henkilöllisyyteni ei saa paljastua kuvasta, jota käytetään ulkoiseen ja sisäiseen tiedottamiseen.

päiväys nimi allekirjoitus

Appendix 2:
Consent form sheet to be used for the personnel at Helsingin Energia

Teemat ja tutkimuskysymykset:

Jokaista teemaa tarkastellaan erikseen yhtenäisen ajanjakson puitteissa, joka vaihtelee kolmesta päivästä viikkoon. Teema ovat osa laajempaa hypoteesia, edustaen näin tämän hetkistä palveluntrjoajan näkökulmaa.

1 Miten taloyhtiön sosiaalista yhteisöä voidaan käyttää vuorovaikutuksen suunnittelun lähtökohtana?

Miten taloyhtiön/asukkaiden tietotaito, toimenpiteet ja toimijat voidaan tehdä näkyväksi ja tunnistaa näkymättömät?

Miten eri kokoiset ja eri asemassa olevat, taloyhtiön toimijoiden ryhmät voidaan huomioida?

Miten käytännön todellisuudessa ilmenevät vastuu, hyöty, tietotaito ja toimijat voidaan tunnistaa ja määritellä taloyhtiön sisällä?

2 Minkälainen on taloyhtiön näkökulmasta "toimi" kulutusseuranta-aktiivi?

Miten sitoutuminen ja tietotaidon vaatimukset voidaan määritellä?

Miten asukkaan valmiudet voidaan tunnistaa ja miten niitä voidaan kehittää?

Miten henkilökohtaiset hyödyt voidaan tunnistaa?

3 Miten palvelun osapuolten välisessä suhteessa näkyvien ja näkymättömien osa-alueiden välille saadaan tasapaino?

Miten häiriönä koetut palveluntuottajan toimenpiteet voidaan kääntää hyviksi palvelukokemuksiksi?

Miten positiiviset, näkymättömät palvelutoimnpiteet voidaan tehdä näkyviksi?

Miten kokonaiskuva voidaan thedä ymmärrettäväksi erottelemalla vastuut, roolit, toimenpiteet ja hyödyt palvelun eri osapuolten välillä?

HUOM! Tämä aihealue käydään läpi ainoastaan yhden esimerkkitilanteen kautta: Kuinka säännöllisesti 3-4 vuoden välein tehtävä talohuolto voidaan tehdä näkyväksi hyväksi palvelukokemukseksi?

4 Miten lämmitys voidaan ilmentää yksittäiselle asukkaalle?

Miten kokemus lämmityksestä voidaan tehdä näkyväksi ja reaktiiviseksi?

Miten lämmityksen kulutukseeen voidaan luoda henkilökohtaista kontrollia?

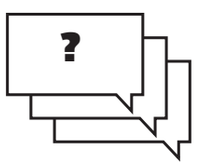
Miten lämmityskulut voidaan muuntaa konkreettisemmaksi ja todellisen tuntuisiksi?

Miten kulujen ja kulutuksen välistä suhdetta voidaan kuvata?

Miten luoda keinoja keskustelun ja rutiinien tukemiseksi?

Miten tehdä kulutusseurannasta kiinnostavaa?

Miten tukea pitkän tähtäimen kulutusseurantaa hyödyntämällä syviä henkilökohtaisia motivatioita?



Appendix 3:
Interview sheet for the residents at Kaarikuja 5

Hei Kaarikuja 5:n asukas/asukkaat,
taloyhtiönne on mukana Aalto-yliopiston vetämässä,
Lähiö 2072- hankkeessa, ja asukkaita pyydetään osallistumaan energiapalveluiden kehittämiseen!

olen Taru, opiskelija, ja teen lopputyötä Aalto- yliopiston Taiteiden ja Suunnittelun korkeakoulussa (entinen Taideteollinen korkeakoulu) ja sen tiimoilta muutan kuukaudeksi rapun A kahvihuoneeseen eli saunan pukuhuoneeseen pitämään väliaikaista "toimistoa", jossa suoritan lopputyöni kenttätutkimus- vaiheen osana Lähiö 2072- hanketta.

Kutsun sinut/teidät käymään saunan pukuhuoneessa katsomassa ja kommentoimassa työskentelyäni, ja antamaan mielipiteesi työstämääni aiheeseen liittyen. Tätä varten pyytäisin yhteystietojasi, jotta voin kutsua sinut/teidät kahvihuoneeseen, kun minulla on valmista näytettävää materiaalia. Näin kenttätyö onnistuu parhaiten (yhteystietoja voi lähettää s-postitse, tekstiviestitse tai kirjoittamalla yhteystietosi keltaiseen lappuun, jonka voi tuoda kahvihuoneeseen). **Jos et halua, että otan suoraan yhteyttä, voit myös vain tulla paikan päälle käymään tuon kuukauden aikana.** Olen tavannut jo joitakin Kaarikuja 5:n asukkaita kahvituvassa, ja toivoisin, että pääsen jututtamaan myös sinua (siinä tapauksessa uudestaan, jos ollaan jo tavattu tuossa pihalla). **Kommentointi ja mielipiteen antaminen ei vaadi minkäänlaista tietämystä aiheesta.**

Teen lopputyötä Helsingin Energialle, ja aiheena on lämmitys eli kaukolämpö ja siihen liittyvät asiat, kuten energian käyttö, sen kustannukset ja energia-asioista puhuminen taloyhtiön sisällä ja Helsingin Energian kanssa. Lopputyön näkökulma on palvelusuunnittelu, ja tarkoituksenani on testata ja tutkia, miten sinä/te asukkaina koette ja näette lämmityksen palveluna ja miten sitä pitäisi kehittää paremmaksi.

Saavun Kaarikujalle ensi viikolla eli maanantaina 14.5. ja olen siellä joka päivä aina 8.6. asti (ei hätää, poistun paikalta ennen saunavuorojen alkamista iltapäivisin). Olen paikalla noin klo 9:00 jälkeen, ja jos minua ei näy jätä viesti pukuhuoneen pöydälle tai soita, sillä saatan olla käymässä Sähkötalossa Kampissa printtaamassa. Käymään voi tulla milloin vain ennen saunavuorojen alkamista. Haluaisin tavata mahdollisimman monta Kaarikujan asukasta.

Olette siis tervetulleita käymään "toimistossani" eli / kahvihuoneessa/saunan pukuhuoneessa!

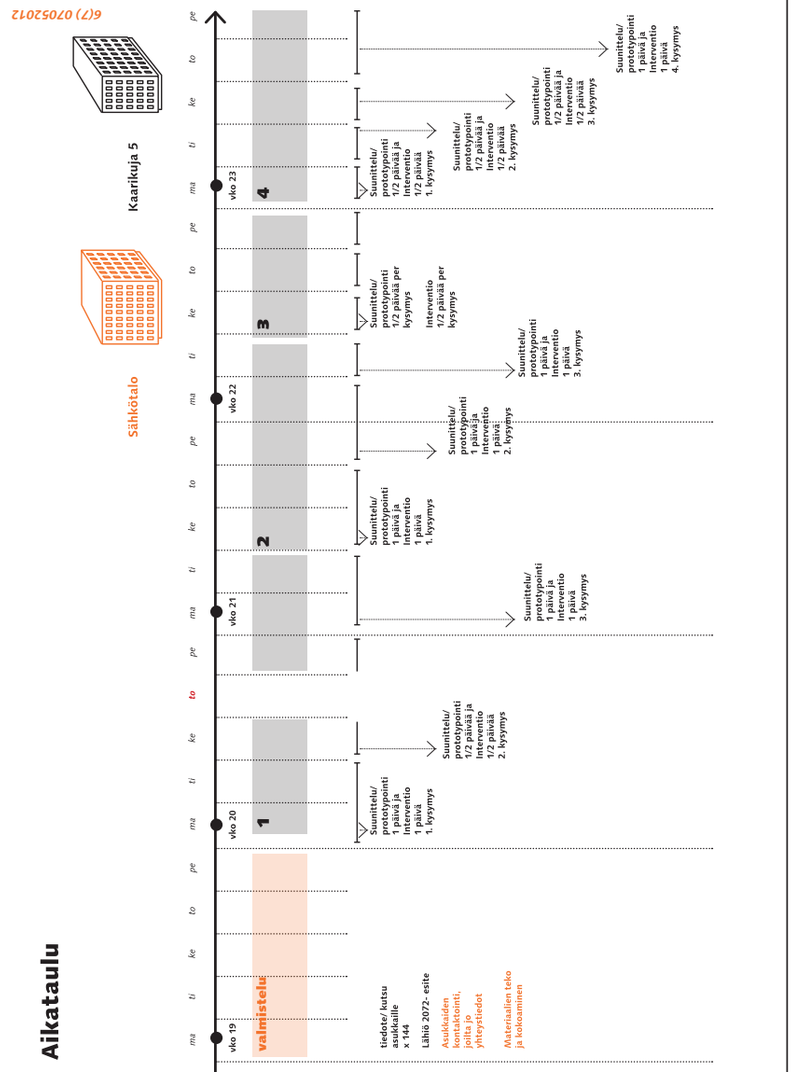
Jos haluatte jutella, mutta ette jostain syystä halua/pysty tulemaan pukuhuoneeseen, niin voin tulla käymään kotonanne tai tavata vaikka rapussa tai pihalla.

Ohessa tietoa hankkeesta ja yhteystietoni. Toivottavasti näemme piakkoin.

Terveisin,
Taru Hynynen

Helsingin Energia Aalto-yliopisto Taiteiden ja suunnittelun korkeakoulu Lähiö 2072

Appendix 4:
Notice for the residents of Kaarikuja 5 of the field work

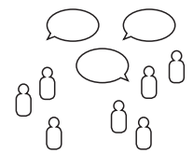


Appendix 5:
Timetable for the field work activities in Kaarikuja 5

Haastatteluopas / Asiantuntija /Peltonen

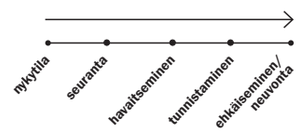
Osa 1
Kulutusseurannassa:

- vuorovaikutuksen suurimmat ongelmat?
(- mitä mahdollisuuksia on olemassa?)
- kuka ottaa yhteyttä?
- miksi loppukäyttäjät ottavat yhteyttä? Miten?
- mitä loppukäyttäjät kysyvät?
- minkälainen on tyypillinen ongelmatilanne?
- mitä tietoa kaivataan?
. mitä tietoa HE tarvitsisi käyttäjiltä?
- mitä sisältöä käyttäjät voisivat tuottaa sinne?
- miten yksityisyyden suoja ja sosiaaliset verkostot ovat mahdollisia kulutusseurannassa (eli kuka saa/voi nähdä ja mitä?)?



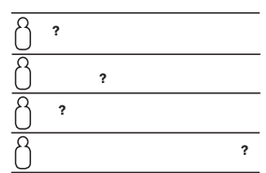
Osa 2
Kulutusseurantaan liittyvät toimenpiteet:

Mitä käyttäjä on tehnyt:
- nykytilanteen määrittämiseksi?
- seurannan suhteen?
- normaali-/nykytilasta poikkeavan tilanteen havaitsemisen suhteen?
- normaali-/nykytilasta poikkeavan tilanteen tunnistamisen suhteen?
- ongelman ehkäisemisen/neuvon saannin suhteen?



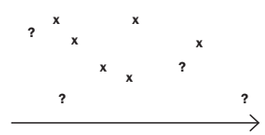
Osa 3
Kulutusseurannan eri tasot toimijoiden suhteen:

Mitä kaikkia toimijoita voidaan tunnistaa:
- asukas
- talonyhtiön hallitus
- isännöitsijä
- huoltomies
- Helsingin Energia
- muita?



Osa 4
Kulutusseurannan kontaktipisteet:

- olemassa olevat kulutusseurannan kontaktipisteet?
- Sävel+:n kontaktipisteet?



Appendix 6:
Interview sheet for the personnel at Helsingin Energia